ACRP

AIRPORT COOPERATIVE RESEARCH PROGRAM

REPORT 19A



Resource Guide to Airport Performance Indicators

Sponsored by the Federal Aviation Administration

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 19A

Resource Guide to Airport Performance Indicators

Robert A. Hazel
OLIVER WYMAN, INC.
Reston, VA

Jan David Blais
JDBASSOCIATES LLC
Watertown, MA

Thomas J. Browne
TJB AVIATION LLC
Clifton, VA

Daniel M. Benzon
TRILLION AVIATION
Austin, TX

Subscriber Categories
Aviation

Research sponsored by the Federal Aviation Administration

TRANSPORTATION RESEARCH BOARD

WASHINGTON, D.C.
2011
www.TRB.org

Copyright National Academy of Sciences. All rights reserved.

AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel, appointed by the TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

ACRP REPORT 19A

Project 01-09
ISSN 1935-9802
ISBN 978-0-309-15538-0
Library of Congress Control Number 20111921215

© 2011 National Academy of Sciences. All rights reserved.

COPYRIGHT INFORMATION

Authors herein are responsible for the authenticity of their materials and for obtaining written permissions from publishers or persons who own the copyright to any previously published or copyrighted material used herein.

Cooperative Research Programs (CRP) grants permission to reproduce material in this publication for classroom and not-for-profit purposes. Permission is given with the understanding that none of the material will be used to imply TRB or FAA endorsement of a particular product, method, or practice. It is expected that those reproducing the material in this document for educational and not-for-profit uses will give appropriate acknowledgment of the source of any reprinted or reproduced material. For other uses of the material, request permission from CRP.

NOTICE

The project that is the subject of this report was a part of the Airport Cooperative Research Program, conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council.

The members of the technical panel selected to monitor this project and to review this report were chosen for their special competencies and with regard for appropriate balance. The report was reviewed by the technical panel and accepted for publication according to procedures established and overseen by the Transportation Research Board and approved by the Governing Board of the National Research Council.

The opinions and conclusions expressed or implied in this report are those of the researchers who performed the research and are not necessarily those of the Transportation Research Board, the National Research Council, or the program sponsors.

The Transportation Research Board of the National Academies, the National Research Council, and the sponsors of the Airport Cooperative Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of the report.

Published reports of the

AIRPORT COOPERATIVE RESEARCH PROGRAM

are available from:

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet at

http://www.national-academies.org/trb/bookstore

Printed in the United States of America

Copyright National Academy of Sciences. All rights reserved.

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is one of six major divisions of the National Research Council. The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

www.national-academies.org

Copyright National Academy of Sciences. All rights reserved.

COOPERATIVE RESEARCH PROGRAMS

CRP STAFF FOR ACRP REPORT 19A

Christopher W. Jenks, *Director, Cooperative Research Programs*
Crawford F. Jencks, *Deputy Director, Cooperative Research Programs*
Michael R. Salamone, *ACRP Manager*
Joseph J. Brown-Snell, *Program Associate*
Eileen P. Delaney, *Director of Publications*
Ellen M. Chafee, *Editor*

ACRP PROJECT 01-09 PANEL
Field of Administration

Christopher A. Poinsatte, *Dallas/Fort Worth International Airport, DFW Airport, TX* (Chair)
Ismael L. Bonilla, *Broward County (FL) Aviation Department, FT Lauderdale, FL*
Rochelle L. "Chellie" Cameron, *Metropolitan Washington Airports Authority, Washington, DC*
Linda G. Frankl, *Columbus Regional Airport Authority, Columbus, OH*
Ellis L. Johnson, *Georgia Institute of Technology, Atlanta, GA*
Joseph E. Richardson, Jr., *JERichardson Aviation Services, LLC, Louisville, KY*
Deborah H. Schwartz, *Strategic Aviation Solutions, LLC, Little Rock, AR*
Elisha Novak, *FAA Liaison*
Liying Gu, *Airports Council International–North America Liaison*
Heather M. Krause, *US Government Accountability Office Liaison*
Laura McKee, *Air Transport Association of America, Inc. Liaison*

AUTHOR ACKNOWLEDGMENTS

ACRP Report 19A: Resource Guide to Airport Performance Indicators was prepared under Airport Cooperative Research Program (ACRP) Project 01-09. The Project Research Team was composed of prime contractor Oliver Wyman, Inc., with subcontractors JDBAssociates LLC; TJB Aviation LLC; Trillion Aviation; Meetings Unlimited LLC; and Creative Strategies Public Relations LLC. The Principal Investigator was Jan David Blais, President of JDBAssociates. Robert Hazel, Partner at Oliver Wyman, served as a Key Researcher, as did Tom Browne, President of TJB Aviation, and Dan Benzon, President of Trillion Aviation. Other research support was provided by Eric Ford and Albert Zhong of Oliver Wyman and John DeCoster of Trillion Aviation. Meeting planning and public relations support were provided by Kristin Ballance of Meetings Unlimited and Shawn Flaherty of Creative Strategies. Graphics and production support were provided by Melissa Ureksoy of Oliver Wyman.

The authors would also like to thank the large number of individuals who provided vital input to the *Resource Guide* through their participation in interviews and workshops conducted by the Resource Team.

Copyright National Academy of Sciences. All rights reserved.

FOREWORD

By Michael R. Salamone
Staff Officer
Transportation Research Board

ACRP Report 19A: Resource Guide to Airport Performance Indicators provides needed depth and detail on airport performance indicators (APIs) for use in benchmarking and performance measurement. These APIs are sorted by functional type and their criticality to the airport strategic plan. More than 800 performance indicators are presented in three main categories: Core, Key, and Other APIs. "Core" or fundamental indicators are important for overall operation of the airport and of interest to the CEO or governing board. "Key" or departmental indicators are important for the operations of key airport functions and departments. The remaining "Other" indicators are considered useful as secondary departmental unit performance indicators but not critical to the airport's overall function. The comprehensive listing of metrics will be useful as a stand-alone document, especially for airports already experienced in performance measurement; it will also be useful for airports that know something should be measured but have not identified what to measure or how to measure performance. The guide addresses performance in nearly every functional area at the airport including administration, human resources, properties, engineering, environment (noise/air/water/sustainability), facility and infrastructure maintenance, finance, information technology, legal, marketing, public relations, operations (airside/landside), and public safety (police/fire/security). An electronic version of the guide, provided with the print version as *CRP-CD-94,* has complete cross-referencing of all performance indicators to help users find and recognize the performance measures that are most relevant to their functional interest. This guide will interest airport board members, directors, department leaders, and other airport employees—as well as industry associations and airport planning professionals and consultants.

Under ACRP Project 01-09, a research team led by Oliver Wyman, Inc., reviewed literature related to airport performance measures; reached out to trade associations, government agencies, and other experts in the field; and conducted two workshops to solicit industry views on airport performance indicators (APIs). Through this process, the researchers developed an extensive list of APIs that can be used in an airport performance-measurement system.

To assist airport practitioners in selecting the APIs that are most appropriate for their particular airport functional interest, each API listing in *ACRP Report 19A* presents and defines each indicator, suggests methods for collecting relevant data, and, generally, supports the implementation of an airport's performance-measurement system as described in *ACRP Report 19: Developing an Airport Performance-Measurement System.*

ACRP Report 19A is the third in a series of ACRP publications focused on measuring and managing airport performance. In addition to the previously mentioned *ACRP Report 19,* readers of this report are encouraged to examine *ACRP Report 20: Strategic Planning in the Airport Industry,* which provides practical guidance on the strategic planning process.

Copyright National Academy of Sciences. All rights reserved.

CONTENTS

1 **Section 1** Overview
1 Types of Airport Performance Indicators
3 Selection of Airport Performance Indicators
4 Core, Key, and Other Airport Performance Indicators
6 Navigating the Resource Guide
8 Self-Benchmarking and Peer Benchmarking

13 **Section 2** Airport Performance Indicators Categorized by Functional Area and Type
19 Airfield Operations (AO)
29 Air Service (AS)
43 ARFF (AR)
51 Cargo (CA)
59 Concessions (CN)
69 Energy Management (EN)
81 Environmental (EV)
95 Financial (FN)
121 Fuel (FL)
125 General Aviation (GA)
131 Grants (GR)
137 Human Resources (HR)
153 Information Technology (IT)
157 Legal (LG)
161 Maintenance (MN)
171 Parking (PK)
181 Planning/Construction (PL)
189 Police/Security (PS)
199 Properties/Contracts (PC)
207 Public Affairs (PA)
213 Safety/Risk Management (SR)
229 Service Quality (SQ)
245 Terminal Operations (TO)

250 **Section 3** Additional Resources
250 Glossary of Terms
256 Bibliography
261 Alphabetical Index of Airport Performance Indicators

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

Copyright National Academy of Sciences. All rights reserved.

SECTION 1

Overview

ACRP Report 19A: Resource Guide to Airport Performance Indicators is the third in a series of Airport Cooperative Research Program (ACRP) publications designed to provide airports with tools for developing and implementing strategic planning and performance-measurement systems. *ACRP Report 19A,* the product of ACRP Project 01-09, has gathered into one place an extensive and categorized set of airport performance indicators (APIs) from which airports can select specific APIs to use in benchmarking, an important component of a successful performance-measurement system. Part 1 of this Resource Guide describes the process through which the APIs were developed, explains the system of categorization used to organize and present the APIs, and provides an overview of the Resource Guide itself. Part 2 presents descriptions of the APIs grouped by functional area and level of importance along with providing a short introduction to each functional area. Part 3 of the Resource Guide provides additional resources, including a glossary of terms, a bibliography, and an alphabetized index of APIs.

To meet the needs of a variety of users, this Resource Guide is provided in print and as a hyperlinked PDF on CD-ROM (*CRP-CD-94: Interactive Resource Guide for ACRP Report 19A*). The print version will be useful to those who wish to read the material straight through or to obtain a more comprehensive understanding of the full array of APIs within each functional area. The hyperlinked electronic version will be useful for those who wish to quickly and easily find related APIs and groups of APIs.

Types of Airport Performance Indicators

In this Resource Guide, three categories of APIs are presented (see Exhibit 1):

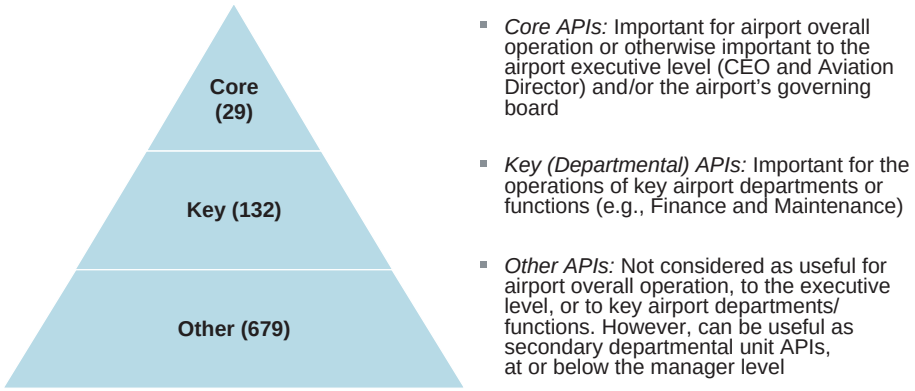
- **Core APIs:** Important for airport overall operation or otherwise important to the airport executive level (CEO and Aviation Director) and/or the airport's governing board
- **Key (Departmental) APIs:** Important for the operations of key airport departments or functions (e.g., Finance and Maintenance)
- **Other APIs:** Not considered as useful for airport overall operation, to the executive level, or to key airport departments/functions. However, these APIs can be useful as secondary departmental unit APIs at or below the manager level

Depending on the circumstances of an airport at a given time, APIs may transition among the categories of Core, Key, and Other. For example, Key and Other APIs dealing with fuel discharges may rise to the level of Core APIs after a significant discharge, particularly if it attracts media attention.

Although some Core and Key APIs will apply to nearly all airports, others will be more limited. For example, APIs using Passengers as the denominator of the ratio (e.g., Concession Revenue to

Copyright National Academy of Sciences. All rights reserved.

Exhibit 1. Core, Key, and Other APIs.



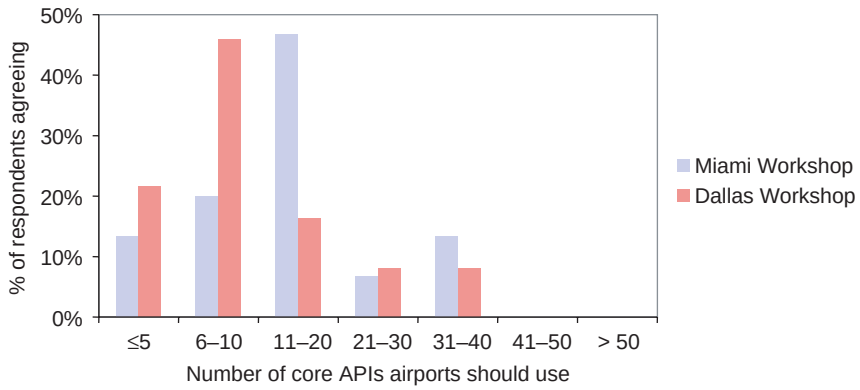
the Airport per Enplanement), will not be applicable to general aviation airports and cargo airports. Some other indicators useful for commercial service airports will not apply to general aviation airports with different traffic bases, funding sources, and clientele. Among commercial service airports, larger airports will focus on different APIs than smaller airports. Even among airports with similar characteristics, managers will have different views on which APIs are most important, and over time these views are likely to change as new issues and challenges arise.

These divergences are illustrated by poll results at two workshops conducted for ACRP Project 01-09, one held in Miami, Florida, and the other in Dallas, Texas. At the Miami workshop, there was 100% agreement on the classification of only a single indicator (out of 33 Core APIs and 50 Key APIs): Airline Cost per Enplanement. Everyone agreed it should be a Core API. At the Dallas workshop, there was not unanimity on the classification of any of the APIs polled.

Individual airport managers will also take different approaches regarding the number of APIs to be used. Some will be comfortable using 20 or more Core APIs; others will be comfortable with less than 10. At the Miami workshop, the largest group of respondents thought airports should use between 11 and 20 Core APIs; the Dallas participants thought 6 to 10 Core APIs was optimal. See Exhibit 2 for a graph illustrating the results of the workshop polls.

These considerations indicate that each airport director and manager will likely develop his/her own set of APIs. The function of this Resource Guide is to suggest choices airport man-

Exhibit 2. Results of workshop polls on the number of core APIs an airport should use.



Copyright National Academy of Sciences. All rights reserved.

agers and other airport professionals will find useful. It does not, of course, "mandate" APIs for use at individual airports. The Research Team's recommended Cores and Keys are just that—recommendations—to be employed and modified according to each user's particular need.

Selection of Airport Performance Indicators

The process of selecting, categorizing, and analyzing individual APIs involved extensive research, interviews with over 40 industry experts, and two industry workshops where more than 75 participants evaluated dozens of APIs.

The Research Team began by scouring articles, airport annual reports, strategic plans and budgets, and other information on airport performance measures, compiling an extensive list of APIs. This initial research work was accompanied by an outreach effort to trade associations, government agencies, and other experts in the field.

This initial round of research produced a list of over 1,000 APIs. For each API, the Research Team collected preliminary information on the following:

- Functional area (34 areas were originally developed, but were later reduced to 23)
- Data sources
- Ease or difficulty in obtaining data
- Types of airports likely to be interested in the API

The initial API list was reduced to 782, eliminating duplicates and near-duplicates. The surviving APIs were then divided into the following groups:

- 100 APIs for consideration as possible Core APIs
- 563 APIs for consideration as possible Key (Departmental) APIs
- 119 APIs not warranting consideration as potential Core or Key APIs but of possible use as secondary departmental unit APIs

After initial ACRP Project Panel review and comment, the Team reduced the Core and Key APIs to a more manageable number and presented its initial recommendations to the Project Panel—a set of 33 Core APIs and 150 Key APIs. These numbers were eventually reduced to the 29 Core APIs and 132 Key APIs found in this Resource Guide. The remaining APIs were put in the "Other" category and retained for future use; most were ultimately included in this Resource Guide as Other APIs.

For each of the recommended Core and Key APIs, the Research Team developed a one-page description similar to those included in this Resource Guide with the following information:

- Functional area
- Name
- Definition
- Data sources
- Applicability
- Comments on usefulness in benchmarking and other issues

After its initial recommendations for Core and Key APIs, the Research Team continued refining the APIs and the one-page descriptions for each API. Feedback was obtained through telephone interviews with experts and the previously mentioned workshops in Miami and Dallas. Comments were solicited on the following:

- Which APIs are most useful
- Which APIs are less useful

Copyright National Academy of Sciences. All rights reserved.

- Additional APIs to consider
- Insights into data and definitional issues

The workshop in Miami was held in conjunction with the ACI-NA Economics and Finance Conference in May 2010. Most of the 24 participants were chief financial officers (CFOs) of medium and large airports. The workshop in Dallas was held during the AAAE Annual Conference. Most of the 51 participants were operationally focused and from the full range of airport sizes; the workshop included at least 10 participants from general aviation airports. The two groups individually and together were not intended to be statistically representative of U.S. airports.

Each of the recommended Core API templates was presented on a large screen and reviewed with the audience. The audience was asked whether each Core API should remain a Core API or be recategorized as Key or Other API.

The Key APIs were reviewed in similar fashion. However, to allow more time for discussion, at the Dallas workshop, the Research Team presented lists of Key APIs grouped by function, prompting comments from workshop participants on which APIs they thought were particularly useful and which ones were not. For the more finance-oriented ACI-NA audience, the Research Team presented seven groups of Key APIs of most interest to that particular audience. For the more operations-oriented AAAE group, the Research Team presented 10 of the remaining groups of Key APIs.

The electronic polling system used by the Research Team allowed each member of the audience to key in his/her preference on an electronic keypad, including comments and reactions to individual APIs. The results were immediately displayed in numeric and graphic form. The Research Team was provided with a complete tally of the polling results after each workshop.

Well over 120 airport professionals, including many leading practitioners of airport performance measurement, reviewed the APIs recommended in this Resource Guide. This review combined with the Research Team's own expertise and judgment produced the 29 Core APIs, 132 Key APIs, and 679 Other APIs included herein. Ultimately, of course, the Research Team is responsible for the selection and content of the APIs recommended in this Research Guide.

Core, Key, and Other Airport Performance Indicators

Core Airport Performance Indicators

Core APIs are performance indicators that are important for overall airport operation or otherwise important to the airport executive level (CEO and Aviation Director) and/or the airport's governing board.

Twenty-nine Core APIs are listed below and fully explained in Part 2 of this Resource Guide. Because of their importance, the Core APIs received the most detailed scrutiny from the Research Team and industry experts. Most airports are expected to use a number of these Core APIs, probably in combination with some Key APIs and Other APIs that particularly fit their organization's needs. Some airport managers may conclude that focusing on only a handful of Core APIs is the best way to address their most critical performance issues. Circumstances may force an API normally of interest only at the department head level (a Key API) or even the manager level (Key APIs and Other APIs) into the spotlight and for a time make it a Core API.

The 29 Core APIs listed below fall within 11 functional areas, which are among the 23 functional areas used to classify the larger set of Key and Other APIs. While all of the Core APIs fall within one of the 23 functional areas, not every functional area has an API that rises to Core API status.

See Exhibit 3 for the complete list of Core APIs together with the two-letter designator for each functional area and the number of each individual API.

Different types of airports will use different APIs. Exhibit 4 lists possible subsets of Core APIs for commercial service, general aviation, and cargo airports. These recommended APIs are suggestions, to be modified based on each user's needs.

Copyright National Academy of Sciences. All rights reserved.

Exhibit 3. Core APIs by functional area and number.

	Core #
Airfield Operations	
Aircraft Operations	AO C-1
Air Service	
Cargo Tons – Change over Prior Period	AS C-2
Enplanements – Change over Prior Period	AS C-3
Nonstop Destinations – Change in Number of Domestic & International	AS C-4
Passenger Flights – Change in Number of Domestic & International	AS C-5
Concessions	
Concession Revenue to the Airport as % of Total Operating Revenue	CN C-6
Concession Revenue to the Airport per Enplanement	CN C-7
Rental Car Revenue to the Airport per Destination Passenger	CN C-8
Financial	
Airline Cost per Enplanement	FN C-9
Airport Cost per Enplanement	FN C-10
Bond Rating	FN C-11
Days Unrestricted Cash on Hand	FN C-12
Debt per Enplanement	FN C-13
Debt Service Coverage Ratio	FN C-14
Non-Aeronautical Operating Revenue as % of Total Operating Revenue	FN C-15
Non-Aeronautical Operating Revenue per Enplanement	FN C-16
Operating Cost per Enplanement	FN C-17
General Aviation	
Based Aircraft	GA C-18
Fuel Use/Sales – Change over Prior Period	GA C-19
Hangar Rental and Ground Lease Income	GA C-20
Human Resources	
M/W/DBE Participation Rate; Actual vs. Cost	HR C-21
Salary + Wages + Benefits Cost as % of Total Operating Cost	HR C-22
Salary + Wages + Benefits Cost per Airport Employee	HR C-23
Parking	
Parking Revenue to the Airport per Originating Passenger	PK C-24
Planning/Construction	
Construction Projects – Actual vs. Budgeted Costs of Significant Projects	PL C-25
Properties/Contracts	
Landing Fee Rate	PC C-26
Safety/Risk Management	
Employee Accidents and Injuries – Lost Work Days	SR C-27
Runway Incursions	SR C-28
Service Quality	
Customer Satisfaction with Airport	SQ C-29

Key (Departmental) Airport Performance Indicators

This Resource Guide contains an extensive set of Key (Departmental) APIs, which are APIs important for the operations of key departments (e.g., Finance and Maintenance) or functions (e.g., energy management and safety/risk management). All 132 Key APIs are listed in Part 2 of this report. As with the Core APIs, a one-page description of each Key API is provided in Part 2. Key APIs are provided for each of the 23 functional areas. The two-letter designator for each functional area is listed as well as the number of each individual API.

Key (Departmental) APIs are performance indicators that are important for the operations of key departments (e.g., Finance and Maintenance) or functions (e.g., energy management and safety/risk management).

The functional areas, the two-letter designator for each area, and the number of Core, Key, and Other APIs within each functional area are listed in Exhibit 5.

Copyright National Academy of Sciences. All rights reserved.

Exhibit 4. General applicability of Core APIs to different airport types.

#	Core Indicator	Commercial Service	General Aviation	Cargo
C-1	Aircraft Operations	■	■	■
C-2	Cargo Tons –Change over Prior Period	■		■
C-3	Enplanements –Change over Prior Period	■		
C-4	Nonstop Destinations –Change in Number of Domestic & International	■		
C-5	Passenger Flights –Change in Number of Domestic & International	■		
C-6	Concession Revenue to the Airport as % of Total Operating Revenue	■	■	
C-7	Concession Revenue to the Airport per Enplanement	■		
C-8	Rental Car Revenue to the Airport per Destination Passenger	■		
C-9	Airline Cost per Enplanement	■		
C-10	Airport Cost per Enplanement	■		
C-11	Bond Rating	■	■	■
C-12	Days Unrestricted Cash on Hand	■	■	■
C-13	Debt per Enplanement	■		
C-14	Debt Service Coverage Ratio	■		■
C-15	Non-Aeronautical Operating Revenue as % of Total Operating Revenue	■		■
C-16	Non-Aeronautical Operating Revenue per Enplanement	■		
C-17	Operating Cost per Enplanement	■		
C-18	Based Aircraft	■		
C-19	Fuel Use/Sales –Change over Prior Period		■	
C-20	Hangar Rental and Ground Lease Income		■	
C-21	M/W/DBE Participation Rate; Actual vs. Cost		■	
C-22	Salary + Wages + Benefits Cost as % of Total Operating Cost	■	■	■
C-23	Salary + Wages + Benefits Cost per Airport Employee	■	■	■
C-24	Parking Revenue to the Airport per Originating Passenger	■	■	■
C-25	Construction Projects –Actual vs. Budgeted Costs of Significant Projects	■		■
C-26	Landing Fee Rate	■	■	■
C-27	Employee Accidents and Injuries-Lost Work Days	■		■
C-28	Runway Incursions	■	■	■
C-29	Customer Satisfaction with Airport	■	■	■

Other APIs are performance indicators not considered as useful as Core or Key APIs for overall airport operation, to the executive level, or to key departments/functions. However, they will be useful as secondary departmental indicators, for example, at or below the manager level. In special circumstances, individual Other APIs may rise to the level of Key or Core APIs.

Other Airport Performance Indicators

All the 679 Other APIs fall into one of the 23 functional categories previously listed for Key APIs. A list of Other APIs in each category, along with definitions, is included in Part 2 of this Resource Guide.

Navigating the Resource Guide

The heart of this Resource Guide is Part 2: Airport Performance Indicators Categorized by Functional Area and Type, which lists all the APIs, introduces each of 23 API functional areas, includes one-page descriptions of each Core and Key API, and provides cross-referencing information. This Resource Guide features several navigation aids to help the user.

Each API is designated by a two-letter code indicating the functional area to which it belongs, a one-letter code designating whether it is a Core, Key, or Other API, and a number for easy reference. The following describes this system in more detail.

Copyright National Academy of Sciences. All rights reserved.

Exhibit 5. Number of APIs by function and type.

		Number of APIs		
Department/Function	**Code**	**Core**	**Key**	**Other**
Airfield Operations	AO	1	6	22
Air Service	AS	4	6	35
ARFF	AR		5	15
Cargo	CA		5	32
Concessions	CN	3	4	38
Energy Management	EN		8	32
Environmental	EV		11	45
Financial	FN	9	11	127
Fuel	FL		1	17
General Aviation	GA	3	1	3
Grants	GR		3	5
Human Resources	HR	3	10	39
Information Technology	IT		2	21
Legal	LG		2	9
Maintenance	MN		6	40
Parking	PK	1	7	18
Planning/Construction	PL	1	4	24
Police/Security	PS		7	44
Properties/Contracts	PC	1	5	17
Public Affairs	PA		4	8
Safety/Risk Management	SR	2	10	31
Service Quality	SQ	1	11	45
Terminal Operations	TO		3	12
		29	**132**	**679**

Indicating Functional Area and Type of Airport Performance Indicator

Each API is assigned to one of 23 functional areas designated by a two-letter code. Functional areas and their two-letter codes are presented in Exhibit 6. In addition to the two-letter code indicating functional area, each API is encoded to indicate its status as a Core, Key, or Other API:

- Core APIs are designated with a "C"
- Key APIs are designated with a "K"
- Other APIs are assigned an "O"

As an example, AS C-2 is a Core API in the functional area of Air Service.

Numbering of Airport Performance Indicators

The 29 Core APIs are numbered consecutively regardless of the functional area they fall within. The first Core API falls within the functional area of Airfield Operations and therefore is numbered AO C-1.

Key and Other APIs are numbered consecutively beginning with K-1 and O-1. Therefore, the first Key API within the functional area of Airfield Operations is numbered AO K-1; the first Other API in that functional area is numbered AO O-1.

Within each functional area, the Core, Key and Other APIs are listed alphabetically. For example, in the functional area of Airfield Operations, Key APIs are listed as shown in Exhibit 7.

Copyright National Academy of Sciences. All rights reserved.

Exhibit 6. API functional areas with two-letter codes.

Functional Area	Two-Letter Code
Airfield Operations	AO
Air Service	AS
ARFF	AR
Cargo	CA
Concessions	CN
Energy Management	EN
Environmental	EV
Financial	FN
Fuel	FL
General Aviation	GA
Grants	GR
Human Resources	HR
Information Technology	IT
Legal	LG
Maintenance	MN
Parking	PK
Planning/Construction	PL
Police/Security	PS
Properties/Contracts	PC
Public Affairs	PA
Safety/Risk Management	SR
Service Quality	SQ
Terminal Operations	TO

Exhibit 7. Key APIs—Airfield Operations.

Closures for Adverse Weather	AO K-1
FOD – Number of Items Found per Inspection	AO K-2
Practical Hourly Capacity	AO K-3
Runway Clearing Time – Average for Snow/Ice	AO K-4
Taxi Time – Gate to Runway End, Peak vs. Unimpeded	AO K-5
Wildlife/Bird Strikes	AO K-6

Functional Area Introductions

Each functional area contains a one-page introduction with the following elements:

- Brief description of the purpose of typical performance measures in that functional area
- Listing of Core and Key indicators in that functional area
- Listing of related Core and Key indicators in other functional areas
- Listing of functional areas of Other APIs to see
- Brief comments on major issues frequently encountered in that functional area

A sample one-page functional area introduction is shown in Exhibit 8.

One-Page Descriptions of Core and Key Airport Performance Indicators

For each of the 29 Core and 132 Key APIs, a one-page description is provided. Each description includes the following:

- API Name
- Definition
- Data sources
- Types of airports to which the API is applicable
- Comments regarding the usefulness and limitations of the API, including whether it is useful for peer airport benchmarking or mainly for self-benchmarking over time
- In some cases, examples of the API that show its use for benchmarking

Exhibit 9 shows an example of an API description, in this case for the Core API Airline Cost per Enplanement. The API's elements and other useful information are highlighted in the Comments section of the description.

This Resource Guide refers users to FAA Form 127 and the ACI-NA Benchmarking Survey as data sources, as well as to other sources such as the airport's own records. Form 127 is available to all. The ACI-NA Survey is widely used, but only ACI members who participate in the survey have access to it. The ACI-NA Survey includes more categories and definitions than does Form 127. In some cases, Form 127 and ACI-NA Survey definitions differ, but an industry effort is currently underway to reconcile the two.

Self-Benchmarking and Peer Benchmarking

Airport benchmarking consists of two separate activities: (1) self-benchmarking, in which the airport measures its own performance over time, and (2) peer benchmarking, in which the airport measures its performance against the performance of airports with similar characteristics ("peers"), against an industry standard, or against an industry "best practice."

Copyright National Academy of Sciences. All rights reserved.

Exhibit 8. Sample functional introduction—Airfield Operations.

Airfield Operations (AO)

Airfield Operations performance measures are used to track airfield operational issues, including factors affecting operational integrity, operations in adverse weather, capacity, delays, and safety.

Core Indicators

Annual Aircraft Operations ..... AO C-1

Key Indicators

Closures for Adverse Weather ..... AO K-1
FOD – Number of Items Found per Inspection ..... AO K-2
Practical Hourly Capacity ..... AO K-3
Runway Clearing Time – Average for Snow/Ice ..... AO K-4
Taxi Time – Gate to Runway End, Peak vs. Unimpeded ..... AO K-5
Wildlife/Bird Strikes ..... AO K-6

Related Core and Key Indicators

Energy Management

Airfield Energy Consumption – Change over Prior Period ..... EN K-1

Safety/Risk Management

Runway Incursions ..... SR C-28
Aircraft Accidents and Incidents ..... SR K-2

Service Quality

Arrival Delay per Flight ..... SQ K-3
Departure Delay per Flight ..... SQ K-5
Percent of Arriving Flights Delayed ..... SQ K-7
Percent of Departing Flights Delayed ..... SQ K-8

See Other Indicators in ..... ARFF, Energy Management, Environmental, Fuel, General Aviation, Maintenance, Safety/Risk Management, Service Quality, Terminal Operations

---

Comments

- Many of these measures are important and closely watched but largely beyond the control of the airport. These may include measures of capacity, delay, and airline/tenant safety.

It should be noted that industry terminology describing benchmarking activity is quite variable, including "internal benchmarking," "external benchmarking," "performance tracking," and "performance measurement," among other usages. This Resource Guide will use the terms "self-benchmarking" and "peer benchmarking."

Both self-benchmarking and peer benchmarking help an airport assess and improve its performance. APIs are used in both techniques, with most APIs suited to self-benchmarking, others suited also to peer benchmarking, and some suited for both.

APIs suited to peer benchmarking are those that lend themselves well to "apples-to-apples" comparisons. For example, the age and energy-efficiency of terminals will affect comparability of maintenance costs and utility costs; age will also influence the cost of servicing recently acquired debt. In order to peer benchmark terminal utility costs most effectively, it is necessary to select airports with terminals of comparable age. On a more "macro" basis, airports may be grouped according to criteria such as size (large hub, medium, small), type of governance (authority, city, state/county, private), or industry segment served (commercial service, general aviation, etc.).

Copyright National Academy of Sciences. All rights reserved.

Exhibit 9. Annotated API description.

API number (Core APIs are C-….) and Functional Area: **FN C-9 Financial**

Name of API

Airline Cost per Enplanement

Definition

Definition

Commonly referred to as CPE (Cost per Enplanement). Average of what airlines pay per enplanement to the airport for use of airfield (landing fees, ramp/apron fees) and terminal space (space rentals net of any credits and reimbursements, plus gate charges). Includes payments for aircraft parking positions (e.g., hard stands, tie-downs), federal inspection fees, and security reimbursements paid by the airline whether to the airport or another agency. Typically excludes special airline facilities self-financed by an airline (e.g., terminal facilities to be operated by the airline). Excludes ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars); airline self-funded construction (e.g., build-out of terminal space); other costs incurred by the airline to operate at the airport (e.g., fuel, maintenance, personnel, services, supplies and equipment) except where the airport provides these services directly (e.g., deicing services at some airports). Does not include delay costs.

Data sources

Data Sources

Airport records, or FAA Form 127.

Applicability to what types of airports

Applicability

All commercial service airports.

Comments on issues regarding definition, data, benchmarking, degree of airport control, etc.

Comments

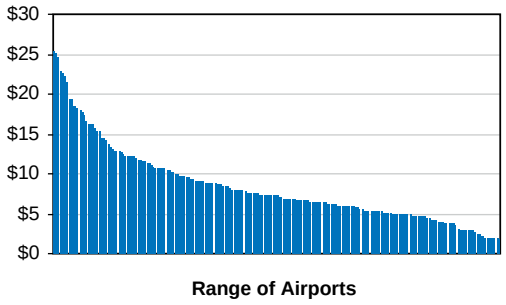
Becomes a difficult measurement where airlines self-invest in terminal facilities—including entire terminals or partial (e.g., certain concourses) and differing levels of airline investment in fit-up and equipment. Such practices remove significant parts of the terminal from the rate base. Can attempt to add back the nominal cost of such excluded rental fees to approach a meaningful API for the airport. Airport CPEs are often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's CPE when initially completed. CPE is highly sensitive to changes in the level of enplanements.

Very important for self-benchmarking, including the trend over time. Because difficult to obtain true "apples-to-apples" measure, less reliable for peer-benchmarking, but this API is one of the most widely used comparative measure among airports.

Examples (for some APIs)

Example

Estimated CPEs for Airports over 100,000 Enplanements



Source: FAA Form 127 and Oliver Wyman analysis

After appropriate peer definition and selection, an API may be used with confidence to peer benchmark against other airports. When in doubt, however, the API is best limited to self-benchmarking. The Core and Key API descriptions in this Resource Guide provide further discussion of comparability and peer group issues.

Another key issue for self-benchmarking and peer benchmarking is the amount of influence or control the airport has over the factors being measured. The airport will not have any significant control over the denominator of certain APIs, such as Airport Total Cost per Enplanement or Per Operation. However, the airport may have substantial control over the numerator, in this

Copyright National Academy of Sciences. All rights reserved.

case, Airport Total Cost. Another example is runway incursions. The airport is responsible for control of its own vehicles, but the airport has no direct control over aircraft or ground vehicles operated by airport tenants. Yet even then, since the airport is responsible for providing clear and effective signage, in some incidents the airport may indeed have an element of responsibility. In cases where airport management has little control over the activities involved, an API may still be used to track results over time (self-benchmark). Core and Key API descriptions discuss management control of the factors affecting a particular API.

Many important APIs are expressed in the form of a ratio; airport management has the greatest influence over APIs where both values are substantially within their control. However, some important measures are not expressed as ratios but as absolute values. These absolute values can be used as APIs to measure performance over time. This Resource Guide, including the Glossary of Terms, contains many such "absolute value" or non-ratio APIs. For example, measuring nonstop destinations, especially international ones, can help airport management identify strengths and weaknesses and know where to direct air service marketing resources. The trend of this service level over time is vital and if it is seen to be moving in the wrong direction, there should be intervention. The airport's bond rating is another example of a non-ratio performance measure whose performance over time is of interest to airport management, users, and governing bodies.

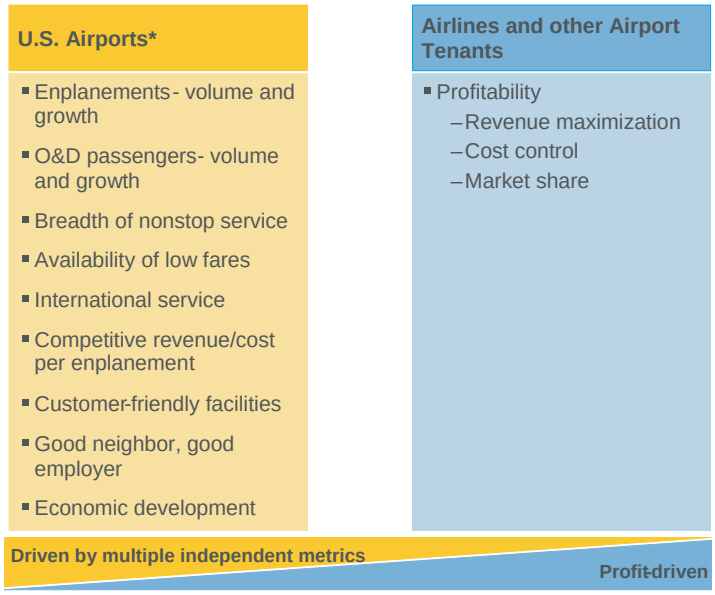
Other cautions in attempting to peer benchmark include the ease or difficulty of obtaining data, ambiguities, and inconsistent definition of terms. The Glossary of Terms in this Resource Guide provides standard definitions, using those found in the ACI-NA Benchmarking Survey or FAA Form 127 wherever possible. This definitional resource should facilitate using the APIs for peer benchmarking.

Used in isolation, the results of individual APIs may be incomplete and misleading, and a combination of APIs may lead to a more complete understanding. For example, Airport A may notice that its Personnel Cost (Salaries + Wages + Benefits) per Enplanement is at a certain level and trending higher, while (having performed a peer benchmarking analysis) it knows that its peer airport, Airport B, has a lower Personnel Cost per Enplanement that is trending downward. So far so good, but more analysis is needed to interpret this API accurately. First, of course, it would be important to understand and normalize the trend of enplanements. Then, looking at the absolute level and trend of Personnel Cost and Airport A's absolute number of employees, Airport A may discover its Personnel Cost per Employee is trending higher mainly because it is making do with fewer employees than Airport B. Having discovered this, Airport A should next look at its practice of contracting work out (another relevant benchmark here is Contract Services Cost as a Percentage of Airport Operating Cost). If Airport A is making significantly greater use of contract services than Airport B, Airport A shouldn't congratulate itself on its performance in controlling employee costs. The cost of contract services needs to be factored in as well. The lesson here is that often several APIs must be examined together and in relation to the absolute values involved, to gain an accurate picture of what is going on. Coming at the situation from a number of angles aids understanding.

Airports have many measures of success and multiple stakeholders who care differently about different issues, and to whom different APIs will be important. The local Chamber of Commerce and frequent fliers will welcome added flights and destinations, but airport neighbors concerned about noise and air quality may disagree. The mayor may view an increase in city police and fire salaries at the airport with equanimity while the airport director worries about how to pay for their services. Pointing to cost and fee benchmarks, the airlines will say their costs are too high, so a big terminal project should be delayed or scrapped, while passengers complain about antiquated facilities. Exhibit 10 compares the multiple measures of success commonly used by airports with the more limited measures of success used by the airlines.

Copyright National Academy of Sciences. All rights reserved.

Exhibit 10. Typical measures of success for airports and airlines.



* Non-privatized U.S. airports

Source: Oliver Wyman

In short, it is normal and to be expected that different airport stakeholders will evaluate the same benchmarked results in very different terms. The challenge for those doing the benchmarking is to present clean data, analyze it responsibly, and describe it clearly. The less time spent arguing over data and methodology issues, the more the benchmarking exercise can help an airport deal with the real issues.

Copyright National Academy of Sciences. All rights reserved.

SECTION 2

Airport Performance Indicators Categorized by Functional Area and Type

Listed below are the 161 APIs that are classified as Core or Key Departmental APIs (29 Core and 132 Key Departmental APIs). Note that Core APIs are numbered beginning with a C (C-1, C-2, etc.), while Key Indicators are numbered beginning with K (K-1, K-2, etc.).

Following this list are separate sections for each of the functional areas listed, each of which contains an introduction to performance measures used in that area, one-page descriptions of each Core and Key API, and a listing of Other APIs.

Core and Key Departmental APIs

Functional Area/API Name	API #
Airfield Operations (AO)	
Annual Aircraft Operations	AO C-1
Closures for Adverse Weather	AO K-1
FOD – Number of Items Found per Inspection	AO-K-2
Practical Hourly Capacity	AO K-3
Runway Clearing Time – Average for Snow/Ice	AO K-4
Taxi Time – Gate to Runway End, Peak vs. Unimpeded	AO K-5
Wildlife/Bird Strikes	AO K-6
Air Service (AS)	
Cargo Tons – Change over Prior Period	AS C-2
Enplanements – Change over Prior Period	AS C-3
Nonstop Destinations – Change in Number of Domestic & International	AS C-4
Passenger Flights – Change in Number of Domestic & International	AS C-5
Average Landed Weight – Change over Prior Period	AS K-1
Average Seats per Flight – Change over Prior Period	AS K-2
Domestic Cargo Flights – Change over Prior Period	AS K-3
Economic Impact	AS K-4
International Cargo Flights – Change over Prior Period	AS K-5
Total Landed Weight – Change over Prior Period	AS K-6
ARFF (AR)	
ARFF Cost – Change over Prior Period	AR K-1
ARFF Cost per Enplanement	AR K-2
ARFF Cost per Operation	AR K-3
ARFF Responses within Mandated Response Times (%)	AR K-4
Airport Medical Emergency Responses within Established Standards	AR K-5

Copyright National Academy of Sciences. All rights reserved.

Functional Area/API Name **API #**

Cargo (CA)
- Airport Warehouse Space Leased (%) . . . . . CA K-1
- All-Cargo Aircraft Landed Weight – Change over Prior Period . . . . . CA K-2
- Domestic Cargo Tons – Change over Prior Period . . . . . CA K-3
- Economic Impact of Cargo Operations . . . . . CA K-4
- International Cargo Tons – Change over Prior Period . . . . . CA K-5

Concessions (CN)
- Concession Revenue to the Airport as % of Total Operating Revenue . . . . . CN C-6
- Concession Revenue to the Airport per Enplanement . . . . . CN C-7
- Rental Car Revenue to the Airport per Destination Passenger . . . . . CN C-8
- Concession Gross Sales per Enplanement . . . . . CN K-1
- Concession Gross Sales per Square Foot . . . . . CN K-2
- Concession Revenue to the Airport per Square Foot . . . . . CN K-3
- FBO Revenue to the Airport – Change over Prior Period . . . . . CN K-4

Energy Management (EN)
- Airfield Electricity Consumption – Change over Prior Period . . . . . EN K-1
- Airport Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) . . . . . EN K-2
- Renewable Energy Generated by the Airport (%) . . . . . EN K-3
- Renewable Energy Purchased by the Airport (%) . . . . . EN K-4
- Tenant Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) . . . . . EN K-5
- Terminal Building Electricity Consumption per Square Foot – Change over Prior Period . . . . . EN K-6
- Utilities/Energy Cost, Airport Total – Change over Prior Period . . . . . EN K-7
- Utilities/Energy Cost per Square Foot of Terminal Building . . . . . EN K-8

Environmental (EV)
- Carbon Footprint . . . . . EV K-1
- Deicing – % Fluid Recovered . . . . . EV K-2
- LEED Building Projects – % New Building Projects Being Built to LEED Standards . . . . . EV K-3
- Environmental Reviews – Timeliness of Completion . . . . . EV K-4
- Environmental Violations – Number of NOVs . . . . . EV K-5
- Night Operations – % Using Preferential Runways . . . . . EV K-6
- Noise Abatement Procedures – % Compliance . . . . . EV K-7
- Noise – Number of Homes within 65 dBA DNL . . . . . EV K-8
- Reportable Discharges, Number . . . . . EV K-9
- Stage 2 Operations < 75,000 Lbs . . . . . EV K-10
- Waste Recycling . . . . . EV K-11

Financial (FN)
- Airline Cost per Enplanement . . . . . FN C-9
- Airport Cost per Enplanement . . . . . FN C-10
- Bond Rating . . . . . FN C-11
- Days Unrestricted Cash on Hand . . . . . FN C-12
- Debt per Enplanement . . . . . FN C-13

Copyright National Academy of Sciences. All rights reserved.

Functional Area/API Name **API #**

Debt Service Coverage Ratio . . . . . FN C-14
Non-Aeronautical Operating Revenue as % of Total Operating Revenue . . . . . FN C-15
Non-Aeronautical Operating Revenue per Enplanement . . . . . FN C-16
Operating Cost per Enplanement . . . . . FN C-17
Accounts Receivable Aging – Days . . . . . FN K-1
Airline Cost per Operation . . . . . FN K-2
Airport Revenue from Non-Passenger-Dependent Sources (%) . . . . . FN K-3
Contract Services Cost as % of Total Operating Cost . . . . . FN K-4
Debt Service as % of Operating Revenue . . . . . FN K-5
Investment Income as % of Invested Assets . . . . . FN K-6
Long-Term Debt per Enplanement . . . . . FN K-7
Net Operating Income per Enplanement . . . . . FN K-8
Net Working Capital (Operating Liquidity) . . . . . FN K-9
Operating Cost per Operation . . . . . FN K-10
Personnel Cost per Enplanement . . . . . FN K-11

Fuel (FL)
Fuel Sales Net Profit/Loss or Fuel Flowage Fees . . . . . FL K-1

General Aviation (GA)
Based Aircraft . . . . . GA C-18
Fuel Use/Sales - Change over Prior Period . . . . . GA C-19
Hangar Rental and Ground Lease Income . . . . . GA C-20
Activity at Nearby Towered Airport – General Aviation . . . . . GA K-1

Grants (GR)
FAA Discretionary Grant Funding Awarded Annually . . . . . GR K-1
FAA Total Grant Funding Awarded Annually . . . . . GR K-2
Grant Funding Other than FAA Awarded Annually . . . . . GR K-3

Human Resources (HR)
M/W/DBE Participation Rate; Actual vs. Goal . . . . . HR C-21
Salary + Wages + Benefits Cost as % of Total Operating Cost . . . . . HR C-22
Salary + Wages + Benefits Cost per Airport Employee . . . . . HR C-23
Airport Employees (FTEs) – Change over Prior Period . . . . . HR K-1
Airport Projects Meeting M/W/DBE Requirements without Waivers (%) . . . . . HR K-2
Annual Employee Turnover . . . . . HR K-3
Benefits as % of Total Compensation . . . . . HR K-4
Employee Evaluations – Timeliness . . . . . HR K-5
Employee Job Satisfaction . . . . . HR K-6
Enplanements per Airport Employee . . . . . HR K-7
Overtime Cost as Percent of Total Wages . . . . . HR K-8
Training Hours per Employee . . . . . HR K-9
Workforce Diversity . . . . . HR K-10

Information Technology (IT)
Mean Time to Repair . . . . . IT K-1
Network-in-Service Time (%) . . . . . IT K-2

Copyright National Academy of Sciences. All rights reserved.

Functional Area/API Name **API #**

Legal (LG)
- Contract Reviews Completed on Time (%) . . . . . LG K-1
- Outside Counsel Fees & Expenses . . . . . LG K-2

Maintenance (MN)
- Airport Vehicles – Average Age . . . . . MN K-1
- Custodial/Janitorial Cost per Square Foot of Terminal . . . . . MN K-2
- Escalators, Moving Walkways, and Elevators – Percent of Time in Service . . . . . MN K-3
- Jet Bridge Maintenance Cost . . . . . MN K-4
- Maintenance Cost per Square Foot of Terminal . . . . . MN K-5
- Runway/Taxiway Maintenance Cost . . . . . MN K-6

Parking (PK)
- Parking Revenue to the Airport per Originating Passenger . . . . . PK C-24
- Parking Revenue per Transaction . . . . . PK K-1
- Parking Spaces . . . . . PK K-2
- Parking Transactions per Month by Parking Product . . . . . PK K-3
- Parking Utilization – Peak Period . . . . . PK K-4
- Privately-Operated Off-Airport Parking Spaces as Percent of Total Parking Spaces . . . . . PK K-5
- Revenue per Day per Parking Space . . . . . PK K-6
- Vehicles Parked per Originating Passenger . . . . . PK K-7

Planning/Construction (PL)
- Construction Projects – Actual vs. Budgeted Costs of Significant Projects . . . . . PL C-25
- Budget Spent versus Work Completed – Specific Significant Capital Projects . . . . . PL K-1
- Change Orders as % of Base Budget – Specific Significant Capital Projects . . . . . PL K-2
- Project Completion Relative to Schedule – Specific Significant Capital Projects . . . . . PL K-3
- Project Cost versus Budget – Specific Significant Capital Projects . . . . . PL K-4

Police/Security (PS)
- Air Operations Area (AOA) Violations . . . . . PS K-1
- Crimes Reported on the Airport . . . . . PS K-2
- Police & Security Guard Costs – Change over Prior Period . . . . . PS K-3
- Police & Security Guard Costs per Enplanement . . . . . PS K-4
- Security Responses within Established Response Time (%) . . . . . PS K-5
- Sworn Police Officer Average Salary (5+ Years Experience) . . . . . PS K-6
- Thefts Reported in Terminal Area . . . . . PS K-7

Properties/Contracts (PC)
- Landing Fee Rate . . . . . PC C-26
- Hangar Rental Rates Compared to Nearby Airport . . . . . PC K-1
- Passenger Airline Aeronautical Fees . . . . . PC K-2
- Percent of Hangar Space Leased . . . . . PC K-3
- Percent of Terminal Space Leased . . . . . PC K-4
- Terminal Rental Rate . . . . . PC K-5

Copyright National Academy of Sciences. All rights reserved.

Functional Area/API Name	API #
Public Affairs (PA)	
Community Complaints – Average Time to Respond	PA K-1
Community Complaints – Number Received	PA K-2
Media Inquiries – Number Received	PA K-3
Media Mentions – Number	PA K-4
Safety/Risk Management (SR)	
Employee Accidents and Injuries – Lost Work Days	SR C-27
Runway Incursions	SR C-28
Accidents and Incidents on Airport Premises	SR K-1
Aircraft Accidents and Incidents	SR K-2
Annual Part 139 Inspection Results	SR K-3
Construction Injuries	SR K-4
Injuries per FTE	SR K-5
Lost Work Days per FTE	SR K-6
OSHA-Reportable Injuries	SR K-7
Safety Code Violations	SR K-8
Vehicle Accidents on Airport Premises	SR K-9
Workers Compensation Claims Paid	SR K-10
Service Quality (SQ)	
Customer Satisfaction with Airport	SQ C-29
Airport Cleanliness – Passenger Perception	SQ K-1
Airport Courtesy – Passenger Perception	SQ K-2
Arrival Delay per Flight	SQ K-3
Baggage Claim – Passenger Perception	SQ K-4
Departure Delay per Flight	SQ K-5
Ease of Connection – Passenger Perception	SQ K-6
Percent of Arriving Flights Delayed	SQ K-7
Percent of Departing Flights Delayed	SQ K-8
Wait Times at Major Processing Sites Other than Security Checkpoints	SQ K-9
Wait Times at Security Checkpoints	SQ K-10
Wayfinding – Passenger Perception	SQ K-11
Terminal Operations (TO)	
Enplanements per Gate	TO K-1
Enplanements per Terminal Square Foot	TO K-2
Gate Utilization	TO K-3

Copyright National Academy of Sciences. All rights reserved.

Airfield Operations (AO)

Airfield Operations performance measures are used to track airfield operational issues, including factors affecting operational integrity, operations in adverse weather, capacity, delays, and safety.

Core Indicators

Annual Aircraft Operations ..... AO C-1

Key Indicators

Closures for Adverse Weather ..... AO K-1
FOD – Number of Items Found per Inspection ..... AO K-2
Practical Hourly Capacity ..... AO K-3
Runway Clearing Time – Average for Snow/Ice ..... AO K-4
Taxi Time – Gate to Runway End, Peak vs. Unimpeded ..... AO K-5
Wildlife/Bird Strikes ..... AO K-6

Related Core and Key Indicators

Energy Management

Airfield Energy Consumption – Change over Prior Period ..... EN K-1

Safety/Risk Management

Runway Incursions ..... SR C-28
Aircraft Accidents and Incidents ..... SR K-2

Service Quality

Arrival Delay per Flight ..... SQ K-3
Departure Delay per Flight ..... SQ K-5
Percent of Arriving Flights Delayed ..... SQ K-7
Percent of Departing Flights Delayed ..... SQ K-8

See Other Indicators in ..... ARFF, Energy Management, Environmental, Fuel, General Aviation, Maintenance, Safety/Risk Management, Service Quality, Terminal Operations

---

Comments

- Many of these measures are important and closely watched but largely beyond the control of the airport. These may include measures of capacity, delay, and airline/tenant safety.

Copyright National Academy of Sciences. All rights reserved.

AO C-1
Airfield Operations

Annual Aircraft Operations

Definition

Total takeoffs and landings (counted separately) including passenger, cargo, and noncommercial (general aviation and military) in reporting period.

Data Sources

Airport records or FAA sources: The FAA's Air Traffic Activity Data System (ATADS) is the official source of historical air traffic activity for FAA Air Route Traffic Control Centers (ARTCCs) and FAA and Contract Towered Airports, as well as counts of services provided by FAA Flight Service Stations. Operations information is available at www.apo.data.faa.gov. Monthly and annual counts of aircraft operations and instrument operations by user category are available. Other sources for non-towered airports include: (1) asking the airport manager, FBO, or other airport personnel, (2) extrapolating a sample count into an annual estimate, and (3) assigning each based aircraft an assumed number of operations.

Applicability

All airports. For general aviation airports one of their most important APIs since they do not track enplanements.

Comments

For general aviation airports, see ACRP publication, Counting Aircraft Operations at Non Towered Airports, ACRP Synthesis No. 4, 2007. See also Forecasting Aviation Activity by Airport, prepared for FAA by GRA, July 2001. FAA Air Traffic Activity Data System (ATADS) contains official air traffic operations data – divided into VFR and IFR.

Categories of GA aircraft operations are often divided into Based versus Transient, and Local versus Itinerant:
Based operations: total operations made by aircraft based at the local airport regardless of purpose.
Transient operations: total operations made by aircraft other than those based at the airport. Typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the local airport.
Local operations: aircraft movements for training, pilot currency or pleasure flying within the immediate area of the local airport. These typically consist of touch-and-go operations, practice instrument approaches, flights to and within practice areas, and pleasure flights originating and terminating at the local airport.
Itinerant operations: arrivals and departures other than local operations that generally originate OR terminate at another airport.

Important for self-benchmarking and peer benchmarking, especially for general aviation airports.

For general aviation airports, total aircraft operations (along with based aircraft) impacts landing fee revenues, fuel sales, FBO sales, airside personnel required, hangar space, etc.

Copyright National Academy of Sciences. All rights reserved.

AO K-1
Airfield Operations

Closures for Adverse Weather

Definition

Number of airport closures for adverse weather annually.

Data Sources

Airport records

Applicability

All airports

Comments

Closures for adverse weather are normally caused by snow and ice, although other severe weather such as hurricanes and thunderstorms may also result in closure. The number of closures is related both to the severity of weather and the airport's ability to keep runways, taxiways and roadways clear. This indicator may reflect variations in weather more than variations in airport performance.

The FAA Flight Delay Information - Air Traffic Control System Command Center tracks airport closures on a real time basis. http://www.fly.faa.gov/flyfaa/usmap.jsp

Important for self-benchmarking. For peer benchmarking, be careful to compare with other airports experiencing similar weather conditions.

Copyright National Academy of Sciences. All rights reserved.

AO K-2
Airfield Operations

FOD – Number of Items Found per Inspection

Definition

Number of FOD items found per inspection

Data Sources

Airport records

Applicability

All airports

Comments

The target in any Foreign Object Damage prevention program should be zero. FAA Advisory Circulars AC 150/5220-24 and 150/5200-18 explain FOD fundamentals. Effective FOD prevention programs require airport management and tenant cooperation.

Finding useful FOD benchmarking data may be difficult, although insurers will track FOD damage. This API may be used for self-benchmarking, also for peer benchmarking where reliable data is available.

Example

FAA Summary of FOD Detection Systems, in AC 150/5220-24

Table 1. Summary of FOD Detection Systems.

System	Detection Principles	Capability
Human / Visual	Fundamental baseline for the performance of FOD detection systems. Human observation provides detection and human judgment provides the hazard assessment capability to assure safety.	Supports regularly scheduled, periodic condition, and special inspections.*
Radar	Uses radio transmission data as the primary means to detect FOD on runways and AOA surfaces.	Fixed systems support continuous surveillance. Mobile systems supplement human/visual inspections.*
Electro-Optical	Uses video technology and image processing data as the primary means to detect FOD on runways and AOA surfaces.	Supports continuous surveillance.
Hybrid	Uses a combination of radar and electro-optical data as the primary means to detect FOD on runways and AOA surfaces.	Supports continuous surveillance.

* Per the inspection frequencies defined in AC 150/5200-18, Section 6.b.

Source: FAA Advisory Circular 150/5220-24

Copyright National Academy of Sciences. All rights reserved.

AO K-3
Airfield Operations

Practical Hourly Capacity

Definition

Average number of operations that can be performed in one hour on a runway with an average delay per operation of four minutes.

Data Sources

Airport records and capacity studies. FAA Aviation System Performance Metrics database.

Applicability

All airports

Comments

Practical Hourly Capacity, also known as PHOCAP, is one of several measures of runway capacity. It assumes capacity is reached when average delays are four minutes per operation. Its annual equivalent, Practical Annual Capacity (PANCAP), is also used by the FAA and airports in capacity studies. Another measure, Maximum Throughput Capacity, assumes no limits on delays.

The FAA publishes capacity benchmarks for 35 major airports. It defines capacity as the maximum number of flights an airport can routinely handle in an hour, for the most commonly used runway configuration in each of three specified weather conditions: (1) Optimum periods of unlimited ceiling and visibility, using visual approaches; (2) Marginal periods when the weather is not good enough for visual approaches, but is still better than instrument approaches; and (3) IFR conductions when radar separation (ceiling less than 1000 feet or visibility less than 3 statute miles) between aircraft is required. The FAA Aviation System Performance Metrics database provides the data for this metric. This API lends itself to self-benchmarking and, given data availability, to peer benchmarking.

Example

Capacity Benchmarks for Operations at 35 Airports
(Arrivals and Departures per Hour)

Airport		Optimum	Marginal	IFR
ATL	Atlanta Hartsfield-Jackson International	180-188	172-174	158-162
BOS	Boston Logan International	123-131	112-117	90-93
BWI	Baltimore-Washington International	106-120	80-93	60-71
CLE	Cleveland Hopkins	80-80	72-77	64-64
CLT	Charlotte/Douglas International	130-131	125-131	102-110
CVG	Cincinnati/Northern Kentucky International	120-125	120-124	102-120
DCA	Ronald Reagan Washington National	72-87	60-84	48-70
DEN	Denver International	210-219	186-202	159-162
DFW	Dallas/Fort Worth International	270-279	231-252	186-193

Source: FAA Airport Capacity Benchmark Report 2004

Copyright National Academy of Sciences. All rights reserved.

24 Resource Guide to Airport Performance Indicators

AO K-4
Airfield Operations

Runway Clearing Time – Average for Snow/Ice

Definition

Average time to clear primary runways and related taxiways of snow/ice accumulation.

Data Sources

Airport records

Applicability

All airports

Comments

Average time to clear primary runways and related taxiways of snow & ice is a function of the amount of snow & ice to be cleared, the rate of snowfall or other winter precipitation, and the manpower, equipment and communication tools employed. This API is best used for self-benchmarking as an airport acquires new equipment or adopts different procedures and technologies. It may also be used for peer benchmarking with airports that experience similar weather conditions.

Copyright National Academy of Sciences. All rights reserved.

AO K-5
Airfield Operations

Taxi Time – Gate to Runway End, Peak vs. Unimpeded

Definition

Average time to taxi from the gate to the runway end during peak periods, compared with unimpeded taxi time.

Data Sources

Airport records

Applicability

All commercial service airports

Comments

Unimpeded taxi time from gate to runway end is compared with average time during peak periods to provide measure of taxi time delay. Although operational changes may improve performance, primary drivers of taxi time will be airfield and taxiway design.

This API may be used for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

26 Resource Guide to Airport Performance Indicators

AO K-6
Airfield Operations

Wildlife/Bird Strikes

Definition

Number of incidents involving wildlife/bird strikes annually.

Data Sources

Airport records

Applicability

All airports

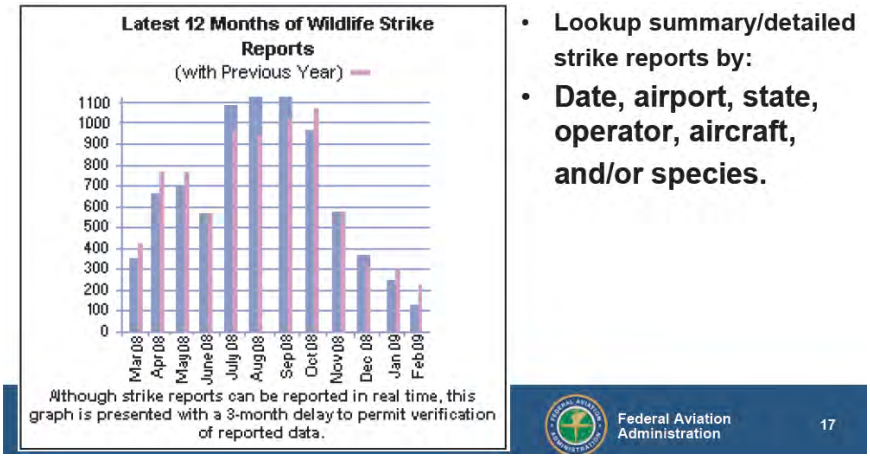
Comments

The FAA has maintained a wildlife strike database since 1990 with the results readily available at http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx. The database contains key information for each wildlife strike, including the date, airport, airline, aircraft, and species involved. During the five years 2004 - 2008, there were 20 reported wildlife strikes (including bird strikes) per day on average.

This API may be used for self-benchmarking, as well as peer benchmarking with other airports having similar wildlife populations.

Although probably too complex for peer benchmarking, individual airports may find it useful to measure and track the direction and distance of bird strikes from the airport.

Example



Source: FAA Wildlife Strike Database

Copyright National Academy of Sciences. All rights reserved.

Airfield Operations – Other APIs

No.	Indicator Name	Definition
AO O-1	Adverse Weather – Average Closing Time	Average length of time airport is closed for adverse weather
AO O-2	Aircraft Operations – Change over Period	Total flights including passenger, nonpassenger (cargo) and noncommercial – change over period
AO O-3	Airfield Non-Air Operations Area	Total acreage of the airfield area exclusive of runways and taxiways
AO O-4	Airport Closures for Snow/Ice Events - Number of	Number of airport closures for snow/ice events
AO O-5	Average Taxi Time Gate to Runway End During Snow/Ice Events	Average taxi time gate to runway end during snow/ice events
AO O-6	Average Time Airport Closed for Adverse Weather Excluding Snow/Ice Events	Average length of time airport is closed for adverse weather excluding snow/ice events
AO O-7	Average Time Airport Closed for Snow/Ice Events	Average length of time airport is closed for snow/ice events
AO O-8	Average Time for Airport Operations to Clear Runways of Snow/Ice Accumulation	Average time for airport operations to clear specific runways of snow/ice accumulation
AO O-9	Declared Capacity of Airport	Expected number of operations per hour airport can accommodate at a reasonable level of service, generally set in range of 85-90% of maximum throughput capacity
AO O-10	FOD Damage ($)	Annual cost of Foreign Object Damage
AO O-11	Maximum Throughput Capacity of Airport (Saturation Capacity)	Expected number of airport operations in one hour assuming continuous demand
AO O-12	Peak Period	Times of maximum aircraft operations at airport. May use seasonal framework, monthly, other.
AO O-13	Roadways - Airfield	Miles of airfield roads
AO O-14	Runway Light Damage per Snow Event	Runway light damage per snow event
AO O-15	Runway Longevity	Length of time runway in service without major repair or reconstruction
AO O-16	Runway Longevity vs Expected Useful Lives	Length of time runway in service without major repair or reconstruction, compared with expected useful life. May be based on industry standards or experience at the particular airport.
AO O-17	Runways - Number of	Number of runways
AO O-18	Sustained Capacity of Airport	Number of operations per hour that can be sustained over a period of several hours
AO O-19	Taxi Time - Gate to Runway End, Adverse Weather vs. Normal	Average time to taxi from a gate to a runway end in adverse weather compared with normal conditions
AO O-20	Taxiway Longevity	Length of time taxiway in service without major repair or reconstruction
AO O-21	Taxiway Longevity vs Expected Useful Lives	Length of time taxiway in service without major repair or reconstruction, compared with expected useful life. May be based on industry standards or experience at the particular airport.
AO O-22	Touch and Go Operations	Training flights for takeoff and landing practice. May involve slowing or stopping the aircraft, but not exiting the runway.

Copyright National Academy of Sciences. All rights reserved.

Air Service (AS)

Air Service performance measures are used to track passenger volume and trends, and the scope and frequency of air service. Air service measures form a basis for determining airport capacity and operating requirements, and are directly correlated with PFC and other revenue sources.

Core Indicators

Cargo Tons – Change over Prior Period ..... AS C-2
Enplanements – Change over Prior Period ..... AS C-3
Nonstop Destinations – Change in Number of Domestic & International..... AS C-4
Passenger Flights – Change in Number of Domestic & International ..... AS C-5

Key Indicators

Average Landed Weight – Change over Prior Period ..... AS K-1
Average Seats per Flight – Change over Prior Period ..... AS K-2
Domestic Cargo Flights – Change over Prior Period..... AS K-3
Economic Impact ..... AS K-4
International Cargo Flights – Change over Prior Period..... AS K-5
Total Landed Weight – Change over Prior Period..... AS K-6

Related Core and Key Indicators

Cargo

All-Cargo Aircraft Landed Weight – Change over Prior Period ..... CA K-2
Domestic Cargo Tons – Change over Prior Period ..... CA K-3
Economic Impact of Cargo Operations..... CA K-4
International Cargo Tons – Change over Prior Period ..... CA K-5

See Other Indicators in ..... Cargo, Service Quality

Typical Subcomponents

Domestic
International
International by Region
Service by Aircraft Type
O&D Passenger
Connecting Passengers

Comments

- Changes in air service are closely watched despite relative lack of control by airport management
- Many communities place a higher value on international air service than domestic; low cost service is also highly-valued
- Cargo service performance is more difficult to measure because:
  - FAA does not collect cargo-related O&D information, making comprehensive and accurate cargo data difficult to obtain
  - Inconsistencies in the reporting of mail volume also frustrate accurate performance measurement.
  - Belly cargo does not pay separate landing fees

Copyright National Academy of Sciences. All rights reserved.

30 Resource Guide to Airport Performance Indicators

AS C-2
Air Service

Cargo Tons – Change over Prior Period

Definition

Growth or decline in cargo tons enplaned and deplaned over the prior reporting period(s).

Data Sources

Airport records or DOT-T100

Applicability

Airports with cargo activity

Comments

This API measures the vitality and trend of the airport's cargo market. Changes in cargo volume are tracked by virtually all airports with significant cargo activity. Cargo tons include both domestic and international, and both freight and mail. Carriers must report cargo tons to DOT including belly cargo and freighter cargo. T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment-based data means actual origin and destination cannot be tracked. Cargo data issues include questions about the completeness of mail volume reporting. Careful for consistency in use of the U.S. Short Ton (2000 lbs), which is prevalent in the U.S., and the Metric Ton or "Tonne" (1000 kg or 2204.6 lbs) of the metric system, converting where necessary.

Some airports point out that cargo volume itself may not be a good indicator of revenue to the airport, and that overall cargo economic impact to the region may be of equal or greater importance. Other airports note that they primarily track cargo landing fee revenue, which in the absence of freighter service, is generated solely by integrators such as FedEx and UPS, and does not capture landing fee revenue from belly cargo.

A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport.

Useful for self-benchmarking and peer benchmarking. Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Example

Washington Dulles August 2010 Air Cargo Report

Description	Enplaned	Deplaned	Total	Year Ago	% Change
Cargo - Tonnes					
Mail:					
Domestic	39	115	154	311	- 50.4
International	210	194	405	420	- 3.5
Total - Mail:	249	310	559	731	- 23.5
Freight + Express:					
Domestic	4,963	5,215	10,178	9,510	7.0
International	6,696	9,651	16,347	12,495	30.8
Total - Freight + Express:	11,659	14,866	26,525	22,005	20.5
Mail Plus Freight + Express					
Domestic	5,002	5,330	10,332	9,821	5.2
International	6,906	9,846	16,752	12,915	29.7
Grand Total - Cargo	**11,908**	**15,176**	**27,084**	**22,736**	**19.1**

Source: Metropolitan Washington Airports Authority website

Copyright National Academy of Sciences. All rights reserved.

AS C-3
Air Service

Enplanements – Change over Prior Period

Definition

Growth or decline in enplanements over the prior reporting period(s).

Data Sources

Airport records or DOT-T100

Applicability

Commercial service airports

Comments

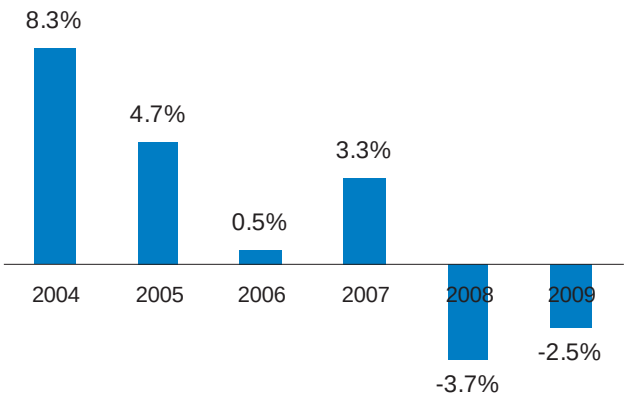
At commercial service airports, the number of enplanements largely drives production of airport revenue (e.g., aeronautical charges, concessions, PFCs, grant funding) and the facilities and services required. Therefore, airports closely monitor the number and trend of enplanements and take steps to attract additional air service.

Very important and heavily used API for self-benchmarking. When used for peer benchmarking it measures the trend and vitality of the airport's passenger market.

Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Example

Change in Enplanements over Prior Year
U.S. Airports



Source: Oliver Wyman analysis of DOT T-100

Copyright National Academy of Sciences. All rights reserved.

32 Resource Guide to Airport Performance Indicators

AS C-4
Air Service

Nonstop Destinations – Change in Number of Domestic & International

Definition

Growth or decline in number of nonstop domestic and international destinations over prior reporting period(s).

Data Sources

Airport records, individual airline schedules, and industry flight information from vendors including OAG and Innovata.

Applicability

Airports with commercial service and charter flights.

Comments

The availability of nonstop service helps communities attract and retain businesses and stimulates travel demand. Airports closely track changes in the number of nonstop destinations. Not every destination is equally important, and domestic and international flights are often tracked separately. International flights, especially transoceanic, are particularly important as they generate higher economic benefits to the region. Airports with freighter service may also track number of nonstop freighter destinations.

Important for self-benchmarking, also peer benchmarking with airports seen as competitive.

Example

Ft. Lauderdale – Domestic and International Nonstop Markets Served

Region	2005	2006	2007	2008	2009	2010
Domestic	71	65	74	79	81	68
International	33	27	40	44	45	40
Total	104	92	114	123	126	108

Source: Oliver Wyman planestats.com

Copyright National Academy of Sciences. All rights reserved.

AS C-5
Air Service

Passenger Flights – Change in Number of Domestic & International

Definition

Growth or decline in number of passenger flights - domestic and international - over the prior reporting period(s).

Data Sources

Airport records, individual airline schedules and reports, and industry flight information from vendors including OAG and Innovata.

Applicability

Airports with commercial service and charter flights.

Comments

Airports closely track the number of flights overall and in individual markets because: (1) more flights generally mean more passengers, and (2) having a greater number of flights in individual markets creates more options for passengers and makes air service more attractive, particularly to business travelers. The number of daily flights required to establish a useful air service pattern varies depending on the type of market served, with short-haul business markets often considered to require a minimum of three flights per day, while long-haul international flights are often considered to require only a single daily or even less (e.g., four or five flights per week). Tracking charter flights is more difficult because published schedule information is often not available.

Substitution of smaller aircraft in a market (even with more frequency) may mask a decline in available seats. See Key API: Average Seats per Flight - Change Over Prior Period.

Very important for self-benchmarking, also important for peer benchmarking with airports seen as competitive.

Copyright National Academy of Sciences. All rights reserved.

34 Resource Guide to Airport Performance Indicators

AS K-1
Air Service

Average Landed Weight – Change over Prior Period

Definition

Increase or decrease in average aircraft landed weight over the prior reporting period(s).

Data Sources

Airport records

Applicability

All commercial service airports

Comments

Provides measure of changing aircraft mix at the airport, which is important to determine facilities requirements as well as to calculate weight-based landing fee budget and landing fee rate. Airports will track not only change in average landed weight (takeoff weight, where applicable), but specific numeric changes in the number of operations by each aircraft type.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

AS K-2
Air Service

Average Seats per Flight – Change over Prior Period

Definition

Increase or decrease in the average seats per airline flight over the prior reporting period(s).

Data Sources

Airline schedules, equipment types, and seat configurations -- usually obtained from OAG or Innovata information, or reported periodically by the airlines to airport management. May also be calculated from airport records, but a more manual process.

Applicability

All commercial service airports.

Comments

Changes in the average number of seats per flight may indicate strengthening or weakening demand, or reflect airline decisions to expand or reduce capacity in particular markets. Average seats per flight and the changes in that measure, are also important for sizing of gates, and other facilities, for airport planners. Not within airport control.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

AS K-3
Air Service

Domestic Cargo Flights – Change over Prior Period

Definition

Increase or decrease in number of domestic cargo flights over the prior reporting period(s).

Data Sources

Airport records

Applicability

All airports with domestic cargo service

Comments

To receive AIP funding, airports must report All-Cargo Flights to the FAA on an annual basis. The airport-filed report lists arrivals by cargo carrier and equipment during each month; however, it does not distinguish between domestic and international flights. Unlike passenger flights, limited schedule information is available for cargo flights.

Useful for self-benchmarking. Utility of peer benchmarking is limited by data availability.

Example

All-Cargo Data Report (CY 2009)

Acme International Airport (XYZ)

Name of Carrier (Carrier Code) / Aircraft Make	Model	Aircraft ID	Landed Weight	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total # Landings	Total Landed Weight (in lbs)
ABX Air (MIW)																	
McDonnell Douglas	DC-8-61	351	240,000	25	20	23	19	8	6		4		12	9	2	128	30,720,000
McDonnell Douglas	DC-9-32	277	101,000	15	14	16	13	15	15	12	10	18	15	14	14	171	17,271,000
Airbus	A300B4	368	299,820	2	3	5	4	2	2	1	2	3	3	2	4	33	9,894,060
Carrier Total				42	37	44	80	25	23	13	16	21	30	25	20	332	67,886,060
Air Cargo Masters (A7MA)																	
Beechcraft	1900	34	16,100	5	2		3		1							11	177,100
Fairchild/Swearingen	III	186	10,500	6												6	63,000
Carrier Total				11	2	0	3	0	1	0	0	0	0	0	0	17	240,100

COLUMN TEMPLATE – Though not preferred, column format may be used for **electronic** submissions **only**. Do not submit column format in a hard copy. Organize data by Carrier, then Aircraft, then month. If submitting electronically using column template, a signed certification statement must accompany the electronic submission (see page 2, Certification Statement and Signature Section).

LOCID	CARCD	CARRIER NAME	AC-MODEL	AC_ID	AC-LANDED-WEIGHT	YEAR	MONTH	# LANDINGS
XYZ	MIW	ABX AIR	DC-8-61	351	240000	2009	1	27
XYZ	MIW	ABX AIR	DC-8-61	351	240000	2009	2	26
XYZ	AMF	AMERIFLIGHT	LR-35A	198	15300	2009	1	68
XYZ	AMF	AMERIFLIGHT	LR-35A	198	15300	2009	2	66
XYZ	AMF	AMERIFLIGHT	LR-35A	198	15300	2009	3	73
XYZ	DHL	DHL AIRWAYS	B-727-200A	79	154500	2009	2	2
XYZ	DHL	DHL AIRWAYS	B-727-200A	79	154500	2009	3	7

Source: FAA website

Copyright National Academy of Sciences. All rights reserved.

AS K-4
Air Service

Economic Impact

Definition

Measures the airport's economic impact on its region in terms of employment and revenues generated. Typically, total economic impact is defined as the sum of direct, indirect and induced impacts.

Data Sources

Airport economic impact studies, typically prepared by consultants.

Applicability

All airports

Comments

See Airport Cooperative Research Program (ACRP) Synthesis 7: Airport Economic Impact Methods and Models for explanation of how airport economic impact studies are conducted.

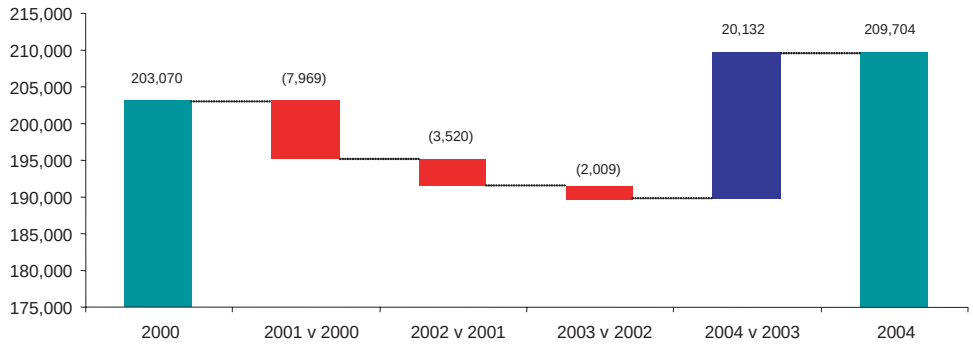
Economic impact studies are usually produced only sporadically and therefore are not typically used for self-benchmarking. However, they may be used for this purpose, as in the example below which illustrates total employment and changes by year for Pennsylvania airports. Many airport economic studies are based on similar economic models, but they are rarely true "apples-to-apples" comparisons and therefore are not well suited to peer benchmarking.

In addition to airport economic impact studies, economic impact studies may be conducted for individual air service routes, especially international. These studies are sometimes used for comparative purposes, as, e.g., in contested international route cases, in which communities submit "dueling" studies to show that their proposed new route would produce the greatest economic benefits for their region.

Not particularly useful for self-benchmarking or peer benchmarking.

Example

Pennsylvania Jobs Created by Air Service
2000 and 2004 Totals and Year-by-Year Change



Source: Pennsylvania Air Service Monitor July 2005

Copyright National Academy of Sciences. All rights reserved.

AS K-5
Air Service

International Cargo Flights – Change over Prior Period

Definition

Increase or decrease in number of international cargo flights over the prior reporting period(s).

Data Sources

Airport records

Applicability

All airports with international cargo service

Comments

International cargo flights are often operated with larger equipment than domestic flights and have a greater economic impact. As discussed regarding domestic cargo flights, airports must file an annual report listing all-cargo flights during each month, but the report does not distinguish between domestic and international flights. Unlike passenger flights, limited schedule information is available for cargo flights.

Useful for self-benchmarking. Utility of peer benchmarking is limited by data availability.

Copyright National Academy of Sciences. All rights reserved.

AS K-6
Air Service

Total Landed Weight – Change over Prior Period

Definition

Increase or decrease in total aircraft landed weight over the prior reporting period(s).

Data Sources

Airport records

Applicability

All commercial service airports

Comments

Provides measure of total aircraft landed weight (takeoff weight, where applicable) at the airport, which is important for calculating weight-based landing fee budget and fee rate. Airports will track not only change in total landed weight, but specific numeric changes in the number of operations by each aircraft type.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Air Service – Other APIs

No.	Indicator Name	Definition
AS O-1	Air Carrier Concentration	Percentage of enplanements by each air carrier
AS O-2	Air Services Development (Marketing) Cost	Air services development (marketing) cost
AS O-3	Air Services Development (Marketing) Cost Included in Airline Rate Base	Air services development (marketing) cost included in airline rate base
AS O-4	Airfare Average vs U.S. Average	Average airfare at airport compared with U.S. average (domestic O&D)
AS O-5	Airfare Change over Prior Period	Airfare change over prior period (domestic O&D)
AS O-6	Airport Economic Impact – Direct and Indirect Jobs	Direct and indirect jobs as a result of airport activity
AS O-7	Airport Economic Impact – Direct and Induced Expenditures	Total direct and indirect expenditures as a result of airport activity
AS O-8	Available Seat Miles	A measure of airline capacity equal to the number of seats available multiplied by the miles flown
AS O-9	Average Load Factor	A measure of airline production equal to revenue passenger miles divided by available seat miles
AS O-10	Average Number of Seats per Airline Operation	Average number of seats per airline operation. Can measure total operations or by specific airlines.
AS O-11	Based Aircraft Counts	Based aircraft counts
AS O-12	Change in Future Scheduled Airline Seats Year-Over-Year	Change in future scheduled airline seats year-over-year
AS O-13	Charter Flights – Number of	Number of charter flights
AS O-14	Domestic Enplanements – Change over Prior Period	Domestic enplanements - change over prior period
AS O-15	Domestic Flights – Number of All Cargo	Number of domestic flights – all cargo
AS O-16	Domestic Flights – Number of Passenger	Number of domestic flights – passenger
AS O-17	Domestic Landed Weight – All-Cargo Aircraft	Domestic landed weight – all-cargo aircraft
AS O-18	Domestic Landed Weight – Passenger Flights	Domestic landed weight – passenger flights
AS O-19	Flights per Day	Number of flights per day. Usually measured as departures per day.
AS O-20	Hits on Airport Website	Hits on airport website
AS O-21	International Arriving Passengers	International Arriving Passengers
AS O-22	International Enplanements – Change over Prior Period	International enplanements – change over prior period
AS O-23	International Flights – Number of All Cargo	Number of international flights – all cargo
AS O-24	International Flights – Number of Passenger	Number of international flights – passenger
AS O-25	International Landed Weight – All-Cargo Aircraft	International landed weight – all-cargo aircraft
AS O-26	International Landed Weight – Passenger Flights	International landed weight – passenger flights
AS O-27	International Passengers to Total Passengers (%)	International passengers as percentage of total international and domestic enplanements
AS O-28	Non-Airline Operations	Total landings plus total takeoffs by non-airline operators at airport
AS O-29	Non-Commercial Traffic as a Percentage of Total Traffic	Operations at airport that do not constitute commercial traffic or non-passenger

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
AS O-30	Nonstop Domestic Destinations – Number of	Number of nonstop domestic destinations
AS O-31	Nonstop International Destinations – Number of	Number of nonstop international destinations
AS O-32	O&D Passengers - Change over Prior Period	O&D passenger – change over prior period
AS O-33	O&D Passengers % of Total Passengers	O&D passengers as percent of total passengers
AS O-34	Passengers Traveling to Markets Served by Nonstop Flights (%)	Percent of passengers traveling to markets served by nonstop flights
AS O-35	Revenue Passenger Miles	A measure of airline production equal to the number of passengers transported by an airline multiplied by the number of miles flown by it

Copyright National Academy of Sciences. All rights reserved.

ARFF (AR)

ARFF performance measures are used primarily to track staffing levels, cost, and response times.

Key Indicators

ARFF Cost – Change over Prior Period ..... AR K-1
ARFF Cost per Enplanement..... AR K-2
ARFF Cost per Operation ..... AR K-3
ARFF Responses within Mandated Response Times (%) ..... AR K-4
Airport Medical Emergency Responses within Established Standards ..... AR K-5

Related Core and Key Indicators

Police/Security

Police & Security Guard Costs – Change over Prior Period .....PS K-3
Police & Security Guard Costs per Enplanement.....PS K-4
Security Responses within Established Response Time (%).....PS K-5
Sworn Police Officer Average Salary (5+ Years Experience) .....PS K-6

Safety/Risk Management

Accidents and Incidents on Airport Premises ..... SR K-1
Aircraft Accidents and Incidents ..... SR K-2
Construction Injuries ..... SR K-4
Injuries per FTE ..... SR K-5
OSHA-Reportable Injuries ..... SR K-7
Vehicle Accidents on Airport Premises..... SR K-9

See Other Indicators in ..... Airfield Operations, Police/Security, Safety/Risk Management, Terminal Operations

---

Comments

- Watch for cross-trained police and fire personnel in comparing ARFF costs.
- Compare airports that are in the same FAA ARFF category.
- At present, there are few widely-used ARFF APIs.

Copyright National Academy of Sciences. All rights reserved.

44 Resource Guide to Airport Performance Indicators

AR K-1
ARFF

ARFF Cost – Change over Prior Period

Definition

Increase or decrease in total airport rescue and firefighting costs (both airport-employed and contracted fire fighters) over prior period.

Data Sources

Airport records and ACI-NA Benchmarking Survey

Applicability

All airports

Comments

An index in the form of a letter (A through E) is assigned to each FAA Part 139 certificate holder based on a combination of aircraft size and the average number of daily departures. That index determines the required number of ARFF vehicles and required amount of extinguishing agents. Some airports provide ARFF services with their own employees, others use fire services of the municipality or county, or private contractors.

Useful for self-benchmarking, also peer benchmarking with similarly-situated airports in the same index category. ARFF Cost per Enplanement or ARFF Cost per Operation is a more useful measure for benchmarking. When performing peer benchmarking, be sure to account for airports that have public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

AR K-2
ARFF

ARFF Cost per Enplanement

Definition

Total airport rescue and firefighting costs (both airport-employed & contracted fire fighters) per enplanement.

Data Sources

Airport records and ACI-NA Benchmarking Survey.

Applicability

All commercial service airports. GA and cargo airports would use a different divisor, such as operations.

Comments

An index in the form of a letter (A through E) is assigned to each FAA Part 139 certificate holder based on a combination of aircraft size and the average number of daily departures. That index determines the required number of ARFF vehicles and required amount of extinguishing agents. Some airports provide ARFF services with their own employees, others use fire services of the municipality or county, or private contractors.

Useful for self-benchmarking, also peer benchmarking with similarly situated airports in same index category. When performing peer benchmarking, be sure to account for airports that have public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

AR K-3
ARFF

ARFF Cost per Operation

Definition

Total airport rescue and firefighting costs (both airport & contracted fire fighters) per operation.

Data Sources

Airport records and ACI-NA Benchmarking Survey

Applicability

All airports

Comments

An index in the form of a letter (A through E) is assigned to each FAA Part 139 certificate holder based on a combination of aircraft size and the average number of daily departures. That index determines the required number of ARFF vehicles and required amount of extinguishing agents. Some airports provide ARFF services with their own employees, while others use fire services of the municipality or county or private contractors.

ARFF Cost per Operation provides a framework that GA and cargo airports can use to benchmark ARFF costs. Useful for self-benchmarking, also peer benchmarking with similarly situated airports in same index category. When performing peer benchmarking, be sure to account for airports that have public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

AR K-4
ARFF

ARFF Responses within Mandated Response Times (%)

Definition

Percent of ARFF responses to emergencies within mandated response times.

Data Sources

Airport records

Applicability

All airports

Comments

Among other requirements, FAR Part 139 establishes a 3-minute response time for the first piece of ARFF equipment to reach the center point of the farthest runway or any other specified point of comparable distance on the movement area, and begin application of the extinguishing agent.

The clear goal for this API is 100% compliance. Useful for self-benchmarking, also peer benchmarking with similarly situated airports in same index category.

Copyright National Academy of Sciences. All rights reserved.

48 Resource Guide to Airport Performance Indicators

AR K-5
ARFF

Airport Medical Emergency Responses within Established Standards

Definition

Percent of airport medical emergency responses within established standards.

Data Sources

Airport records

Applicability

All airports

Comments

This critical life safety function is measured using a series of time intervals, including response time, scene time, and transport time. The National EMS Database Report Specification defines these intervals and other measures. Some EMS response time standards require that 90% of emergency responses fall within the stated time period. Airport goals should be to respond 100% of the time within the standards set.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

ARFF – Other APIs

No.	Indicator Name	Definition
AR O-1	Airport Hazmat Emergency Responses within Established Standard Times per Number of Airport Hazmat Emergency Responses	Airport hazmat emergency responses within established standard times per number of airport hazmat emergency responses
AR O-2	Airport Hazmat Emergency Responses within Established Standards	Airport hazmat emergency responses within legal requirements
AR O-3	Airport Medical Emergency Responses within Established Standard Times per Number of Airport Medical Emergency Responses	Airport medical emergency responses within established standard times per number of airport medical emergency responses
AR O-4	ARFF Cost per Firefighter	Total ARFF cost per firefighter
AR O-5	ARFF Cost per Runway	Total ARFF cost per runway
AR O-6	ARFF Employees (FTEs)	Total number of ARFF employees (FTEs)
AR O-7	ARFF Employees Who Are Not Active Firefighters	Number of ARFF employees who are not active firefighters
AR O-8	ARFF Overtime Cost	ARFF overtime cost
AR O-9	ARFF Salary & Benefits Cost	ARFF salary & benefits cost
AR O-10	ARFF Staffing versus ARFF Index	ARFF staffing compared with federal requirements for the airport's index
AR O-11	Disaster Drills per Period – Number of	Number of disaster drills per period
AR O-12	Firefighters – Number of	Number of active duty firefighters (FTEs)
AR O-13	Fires – Number of	Number of fires by location, by cause
AR O-14	Hours per Firefighter per Week	Average hours worked in a week per firefighter
AR O-15	Overtime Cost as Percentage of Total ARFF Cost	Overtime cost as percentage of total ARFF cost

Copyright National Academy of Sciences. All rights reserved.

Cargo (CA)

Cargo performance measures are used primarily to track cargo volume, cargo revenue produced for the airport, and the economic impact of cargo.

Key Indicators

Airport Warehouse Space Leased (%) ..... CA K-1
All-Cargo Aircraft Landed Weight – Change over Prior Period ..... CA K-2
Domestic Cargo Tons – Change over Prior Period ..... CA K-3
Economic Impact of Cargo Operations ..... CA K-4
International Cargo Tons – Change over Prior Period ..... CA K-5

Related Core and Key Indicators

Air Service

Cargo Tons – Change over Prior Period ..... AS C-2
Domestic Cargo Flights – Change over Prior Period ..... AS K-3
International Cargo Flights – Change over Prior Period ..... AS K-5

See Other Indicators in ..... ***Air Service, Police/Security***

Comments

- Comprehensive and accurate cargo data is difficult to obtain since FAA does not collect O&D cargo information.
- Other cargo data issues include incomplete reporting of mail volume.
- Cargo landed weight applies to freighters only. Airport revenue impact of belly cargo is difficult to measure.

Copyright National Academy of Sciences. All rights reserved.

52 Resource Guide to Airport Performance Indicators

CA K-1
Cargo

Airport Warehouse Space Leased (%)

Definition

Percent of airport warehouse space leased.

Data Sources

Airport records

Applicability

All airports with warehouse space

Comments

Measures occupancy of airport warehouse space. As occupancy increases, airport may need to begin planning for construction of additional space. Declining occupancy may reflect weak demand or competitive issues.

It may also be useful to measure cargo throughput (in Tons) against airport warehouse space.

Useful for self-benchmarking, not particularly useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

CA K-2
Cargo

All-Cargo Aircraft Landed Weight – Change over Prior Period

Definition

Change in landed weight of all-cargo flights over the prior period.

Data Sources

Airport records

Applicability

All airports with cargo

Comments

Does not capture change in belly cargo or its impact on landed weight.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

54 Resource Guide to Airport Performance Indicators

CA K-3
Cargo

Domestic Cargo Tons – Change over Prior Period

Definition

Change in total domestic cargo tons enplaned and deplaned over the prior period.

Data Sources

Airport records and DOT T-100 cargo data

Applicability

All airports with cargo

Comments

Domestic cargo includes both freight and mail. T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment based data means actual origin and destination cannot be tracked. Domestic cargo data from the T-100 is available on a monthly basis approximately 3 months after the end of the month.

Careful for consistency in use of the U.S. Short Ton (2000 lbs or .906 of the Metric Ton), which is prevalent in the U.S., and the Metric Ton or "Tonne" (1000 kg or 2204.6 lbs) of the metric system, converting where necessary.

May be useful to track O&D cargo tonnage and transit tonnage separately.

A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport.

Useful for self-benchmarking and peer benchmarking.

Example

Metropolitan Washington Airports Authority
Washington Dulles International Airport
Monthly Air Traffic Summary Report
February 2009 - January 2010

Description	Enplaned	Deplaned	Total	Year Ago	% Change
Cargo - Tonnes					
Mail:					
Domestic	1,992	2,179	4,171	5,340	- 21.9
International	2,975	2,725	5,700	7,950	- 28.3
Total - Mail:	4,967	4,904	9,871	13,290	- 25.7
Freight + Express:					
Domestic	60,050	59,656	119,706	134,190	- 10.8
International	77,559	89,880	167,439	180,463	- 7.2
Total - Freight + Express:	137,609	149,536	287,145	314,652	- 8.7
Mail Plus Freight + Express:					
Domestic	62,042	61,835	123,877	139,530	- 11.2
International	80,534	92,605	173,140	188,412	- 8.1
Grand Total - Cargo	**142,577**	**154,440**	**297,017**	**327,943**	**- 9.4**

Source: Metropolitan Washington Airports Authority website

Copyright National Academy of Sciences. All rights reserved.

CA K-4
Cargo

Economic Impact of Air Cargo Operations

Definition

Measures the regional economic impact of air cargo operations in terms of total employment and revenues generated. Typically, total economic impact is defined as the sum of direct, indirect and induced impacts.

Data Sources

Airport economic impact studies, typically prepared by consultants

Applicability

All airports with cargo

Comments

As noted by ACRP, "air cargo services are part of a complex network of diverse economic production and distribution activities carried out across a wide spectrum of airport configurations. In response to this diversity, approaches employed by airports must account for differing operational roles with a variety of facilities located in many locales." Current ACRP Project 03-16 will produce a Guidebook for Estimating the Economic Impact of Air Cargo at Airports with a final report expected in 2011. See also Airport Cooperative Research Program (ACRP) Synthesis 7: Airport Economic Impact Methods and Models for explanation of how airport economic impact studies are conducted.

Economic impact studies are usually produced only sporadically and therefore are not typically used for self-benchmarking, although they may be used for this purpose. Many airport economic studies are based on similar economic models, but they are rarely true "apples-to-apples" comparisons and therefore are not well suited to peer benchmarking.

In addition to airport economic impact studies, economic impact studies may be conducted for individual air cargo routes, especially international. These studies are sometimes used for comparative purposes, as, e.g., in contested international route cases, in which communities submit "dueling" studies to show that their proposed new route would produce the greatest economic benefits for their region.

Not particularly useful for self-benchmarking or peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

56 Resource Guide to Airport Performance Indicators

CA K-5
Cargo

International Cargo Tons – Change over Prior Period

Definition

Change in total international cargo tons enplaned and deplaned over the prior period.

Data Sources

Airport records and DOT T-100 cargo data

Applicability

All airports with cargo

Comments

International cargo includes both freight and mail. T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment based data means actual origin and destination cannot be tracked. International cargo data from the T-100 is available on a monthly basis approximately 6 months after the end of the month. Careful for consistency in use of the U.S. Short Ton (2000 lbs or .906 of the Metric Ton), which is prevalent in the U.S., and the Metric Ton or “Tonne” (1000 kg or 2204.6 lbs) of the metric system, converting where necessary.

May be useful to track O&D cargo tonnage and transit tonnage separately using airport records.

Useful for self-benchmarking and peer benchmarking.

A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport.

Copyright National Academy of Sciences. All rights reserved.

Cargo – Other APIs

No.	Indicator Name	Definition
CA O-1	Airport Direct Operating Cost per Enplaned Cargo Ton	Average airport direct operating cost per enplaned cargo ton
CA O-2	Airport Indirect (Administrative Overhead) Cost per Enplaned Cargo Ton	Airport indirect (administrative overhead) cost per enplaned cargo ton
CA O-3	Airport Warehouse Space	Total airport warehouse space in sq. ft. May also be measured in cubic ft.
CA O-4	Airport Warehouse Space – Change over Prior Period	Change in sq. ft. of warehouse space over prior period May also be measured in cubic ft.
CA O-5	Cargo Space Leased per Ton Moved	Cargo space leased per ton moved
CA O-6	Cargo Economic Impact – Direct and Induced Expenditures	Total expenditures generated as a result of air cargo activity
CA O-7	Cargo Economic Impact – Direct and Induced Expenditures per Ton	Total expenditures generated as a result of air cargo activity per enplaned cargo ton of
CA O-8	Cargo Economic Impact – Direct Jobs	Number of direct jobs created by cargo activity at the airport
CA O-9	Cargo Economic Impact – Direct Jobs per Ton	Number of direct jobs created by cargo activity at the airport per enplaned cargo ton
CA O-10	Cargo Fees Revenue to Airport per Warehouse Square Foot	Total airport cargo revenue (fees and charges) per square foot of on-airport warehouse space
CA O-11	Cargo Operating Cost per Ton	Airport operating costs resulting from cargo activity per enplaned cargo ton
CA O-12	Cargo Operating Cost per Ton of CMGTW	Cargo operating costs per certificated maximum gross takeoff weight
CA O-13	Cargo Operating Costs	Airport operating costs resulting from cargo activity
CA O-14	Cargo Revenue to the Airport as a Percent of Total Airport Operating Revenue	Revenue to the airport resulting from fees and charges from cargo activities, as a percent of total airport operating revenue
CA O-15	Cargo Revenue to the Airport per Ton	Revenue to the airport resulting from fees and charges from cargo activities per tons of cargo
CA O-16	Cargo Tons Deplaned	Cargo tons deplaned at the airport
CA O-17	Cargo Tons Enplaned	Cargo tons enplaned at the airport
CA O-18	Domestic Belly Cargo Tons Enplaned	Enplaned plus deplaned domestic belly cargo in tons
CA O-19	Domestic Cargo Flights	Domestic cargo flights
CA O-20	Domestic Freighter Cargo Tons Enplaned	Enplaned plus deplaned domestic freighter cargo in tons
CA O-21	Domestic Transit Cargo in Tons	Domestic inbound plus outbound transit cargo tons
CA O-22	Enplaned Cargo Tons per Airport Employee	Cargo tons enplaned per airport employee
CA O-23	International Belly Cargo Tons Enplaned	Enplaned plus deplaned international belly cargo in tons
CA O-24	International Cargo Flights	International cargo flights
CA O-25	International Freight Tons Enplaned	Enplaned plus deplaned international freighter cargo in tons
CA O-26	International Transit Cargo in Tons	International inbound plus outbound transit cargo tons
CA O-27	Long-Term Debt per Enplaned Cargo Ton	Amount of airport long-term debt per enplaned cargo ton
CA O-28	Off-Airport Cargo Warehouse Throughput	Off-airport cargo warehouse throughput in tons

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
CA O-29	On-Airport Cargo Warehouse Throughput per Square Foot	Air cargo on-airport warehouse throughput in tons per square foot
CA O-30	Total Airport Cost per Cargo Ton	Airport total cost per enplaned cargo ton
CA O-31	Total Revenue to the Airport from Cargo Activities	Total airport revenue produced by fees and charges from airport cargo activities
CA O-32	Truck Waiting Time	Average truck dwell time waiting for loading or unloading docks – on-airport warehouses

Copyright National Academy of Sciences. All rights reserved.

Concessions (CN)

Concession performance measures are used primarily to track concession sales and net income to the airport in total and by category of concession.

Core Indicators

Concession Revenue to the Airport as % of Total Operating Revenue ..... CN C-6
Concession Revenue to the Airport per Enplanement ..... CN C-7
Rental Car Revenue to the Airport per Destination Passenger..... CN C-8

Key Indicators

Concession Gross Sales per Enplanement..... CN K-1
Concession Gross Sales per Square Foot ..... CN K-2
Concession Revenue to the Airport per Square Foot..... CN K-3
FBO Revenue to the Airport – Change over Prior Period..... CN K-4

Related Core and Key Indicators

Financial

Non-Aeronautical Operating Revenue as % of Total Operating Revenue ..... FN C-15
Non-Aeronautical Operating Revenue per Enplanement ..... FN C-16

See Other Indicators in ..... *Financial, General Aviation, Parking, Properties/Contracts, Service Quality*

Typical Subcomponents

Food and Beverages
News and Gift
Specialty Retail
Duty Free
Advertising
Services (ATM, Currency Exchange, etc.)
Passenger Services

Comments

- International airports may have large duty free sales, which should be isolated before comparing to domestic airports.
- Watch for categories included in definition of concessions. Various components may be mixed in.
- Higher gross sales per enplanement may or may not translate into higher net to airport.
- Watch for differences in airport-provided fit-up and maintenance obligations.
- In benchmarking, important to control for domestic/international composition.
- Watch for differing passenger profiles, different sq. ft. devoted to concessions, presence of “street pricing” among comparables.

Copyright National Academy of Sciences. All rights reserved.

60 Resource Guide to Airport Performance Indicators

CN C-6
Concessions

Concession Revenue to the Airport as % of Total Operating Revenue

Definition

Concession revenue received by the airport as a percentage of total airport operating revenue.

Data Sources

Airport records or FAA Form 127. Also, *Airport Revenue News Annual Factbook* provides more detailed information on concession sales for many U.S. airports. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions.

Applicability

All airports

Comments

This is a net revenue concept. For gross revenues, see Concession Gross Sales.

Factors affecting revenue include amount of space devoted to concessions, location, pricing policy, range of offerings, and financial terms of the airport's contractual arrangements with concessionaires.

Careful for consistency on concessions included, e.g., advertising, telecommunications, and other services. FAA Form 127 and ACI-NA Benchmarking Survey divide concession revenue into terminal, rental car, public parking & ground transportation, and other. Primary concession measure in Form 127, Terminal Concession Revenue, includes revenues (income) to the airport from sales at airport concessions located inside the terminal only. Includes minimum annual guarantee payments, percentage rent; excludes utilities and storage. Does not include rental car revenues even though some rental car facilities (e.g., check-in counters) are often located inside terminals. Does not include parking or ground transportation revenues even though some of such facilities may be inside or associated with the terminal.

Important for self-benchmarking and peer benchmarking because concession revenues are a key contributor to airport operating revenues. Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Copyright National Academy of Sciences. All rights reserved.

CN C-7
Concessions

Concession Revenue to the Airport per Enplanement

Definition

Concession revenue received by the airport per enplanement - generally limited to terminal concessions based on FAA Form 127 definition.

Data Sources

Airport records or FAA Form 127. Also, *Airport Revenue News Annual Factbook* provides more detailed information on concession sales for many U.S. airports. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions.

Applicability

All commercial service airports. General aviation airports will look at total concession revenue, and change from prior period.

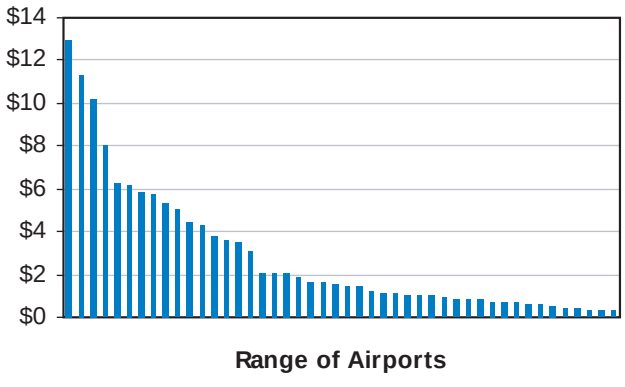
Comments

Revenue to the airport is a function of both gross sales and the airport's contractual arrangements with concessionaires. International airports may have large duty free sales, which should be isolated before comparing to domestic airports. Also, in benchmarking, group airports by size, but medium and large airports may have similar concession profiles. Careful to be consistent on concessions included, e.g., advertising, telecommunications, and other services.

Important for self-benchmarking and peer benchmarking because concession revenues are a key contributor to airport operating revenues. Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Example

In-Terminal Concession Revenue per Enplanement for Airports over 1 Million Enplanements



Source: FAA Form 127 and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

CN C-8
Concessions

Rental Car Revenue to the Airport per Destination Passenger

Definition

Rental car revenue received by the airport per destination passenger. Destination passengers are usually measured as O&D passengers/2. However airports which track originating and destination passengers separately have the opportunity for more precision by using actual destination passenger data.

Data Sources

Rental car revenue - airport record or Form 127. Destination passengers - DOT O&D Survey.

Applicability

All commercial service airports. General aviation airports may track change in rental car revenue over prior period.

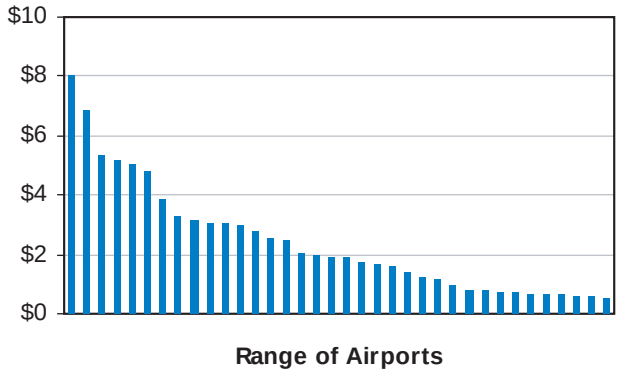
Comments

Usually one of the most important sources of non-aeronautical revenue. Urban airports in major cities may produce lower revenue due to the availability of public transportation; major tourist destinations may produce higher revenue. Major factors are volume and agreement terms. An often-seen, but less useful alternative measure, is Rental Car Revenue per Enplanement, which counts connecting passengers as opposed to just destination passengers.

Important for self-benchmarking and peer benchmarking. Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Example

Rental Car Revenue to Airport per O&D Passenger/2 for Airports with 1-5 Million Enplanements



Source: FAA Form 127 and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

CN K-1
Concessions

Concession Gross Sales per Enplanement

Definition

Concession gross sales per enplanement - generally limited to terminal concessions.

Data Sources

Airport records or FAA Form 127. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions. Also, Airport Revenue News Annual Factbook provides more detailed information on concession sales for many U.S. airports.

Applicability

All commercial service airports. General aviation airports may use a different divisor.

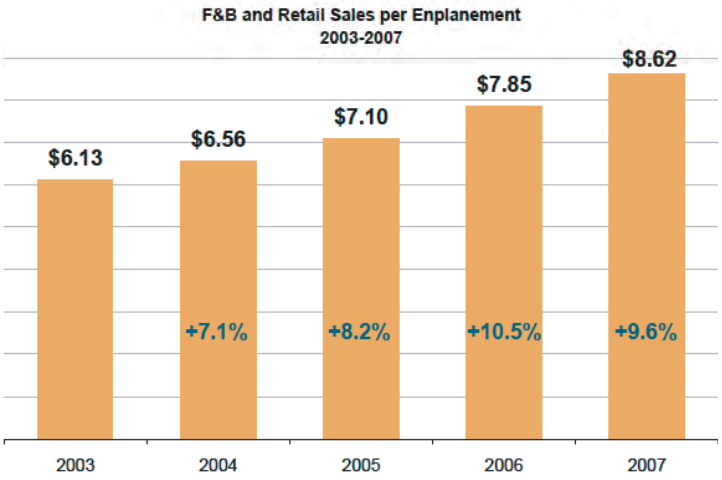
Comments

Note that high gross sales may not translate into high revenue to the airport depending on the airport's contractual arrangement with the concessionaires. International airports may have large duty free sales, which should be isolated before comparing to domestic airports. Also, in benchmarking, group airports by size, but medium and large airports may have similar concession profiles. Careful to be consistent on concessions included, e.g., advertising, telecommunications, and other services.

Important for self-benchmarking and peer benchmarking. Useful to track over different reporting periods to spot trends - e.g., annual, monthly, rolling 12 months.

Example

Gross Sales per Enplanement - LAX



Source: LAX Concessions 101, August 2008

Copyright National Academy of Sciences. All rights reserved.

64 Resource Guide to Airport Performance Indicators

Concession Gross Sales per Square Foot

Definition

Concession gross sales per square foot - generally limited to terminal concessions.

Data Sources

Airport records or FAA Form 127. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions. Also, Airport Revenue News Annual Factbook provides more detailed information on concession sales for many U.S. airports.

Applicability

All commercial service airports

Comments

Tracking gross concession sales per square foot helps airports maximize their concession revenue by highlighting high-performing and low-performing concessions, and by permitting airports to compare their concession sales performance with peer airports.

Note that high gross sales may not translate into high revenue to the airport depending on the airport's contractual arrangement with the concessionaires. International airports may have large duty free sales, which should be isolated before comparing to domestic airports. Also, in benchmarking, group airports by size, but medium and large airports may have similar concession profiles. Watch for categories included in definition, especially advertising, telecommunications, and other services.

Useful for self-benchmarking and peer benchmarking because concession revenues are a key contributor to airport operating revenues.

Example

Concession Gross Sales per Square Foot
Illustrative Results from Oliver Wyman Study Using 2007 Data

Measure	Food and Beverage ($ per ft)	Retail ($ per ft)		
		Speciality Retail	News & Gifts	Retail Total
Quartile 1	$278.26	$241.28	$356.85	$224.27
Quartile 2	$633.68	$546.59	$946.89	$757.45
Quartile 3	$819.81	$779.58	$1,251.27	$986.96
Quartile 4	$1,205.15	$1,026.16	$1,745.66	$1,284.95
Maximum	$2,592.55	$2,347.56	$4,059.93	$2,686.62
Average	$937.60	$850.09	$1,398.99	$1,048.05

Source: FAA Form 127 and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

CN K-3
Concessions

Concession Revenue to the Airport per Square Foot

Definition

Concession revenue to the airport per square foot - generally limited to terminal concessions.

Data Sources

Airport records or FAA Form 127. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions. Also, Airport Revenue News Annual Factbook provides more detailed information on concession sales and net to the airport for many U.S. airports.

Applicability

All commercial service airports

Comments

Tracking net concession revenue per square to the airport helps airports maximize their revenue from concessions by highlighting high-performing and low-performing concessions, and by permitting airports to compare their concession sales performance with peer airports. With airport terminal square footage at a premium, it is important to optimize the revenue produced from concession space.

Note that many airports track gross sales instead of concession revenue to the airport. However, high gross sales may not translate into high revenue to the airport depending on the airport's contractual arrangement with the concessionaires, so both measures are important.

Useful for self-benchmarking and peer benchmarking.

Example

Concession Revenue to the Airport per Square Foot
Illustrative Results from Oliver Wyman Study Using 2007 Data

Measure	Food and Beverage ($ per ft)	Retail ($ per ft²)		
		Speciality Retail	News & Gifts	Retail Total
Quartile 1	$29.58	$28.51	$50.62	$50.62
Quartile 2	$72.60	$78.74	$135.24	$112.90
Quartile 3	$115.45	$114.50	$209.38	$151.38
Quartile 4	$167.24	$157.13	$271.49	$222.22
Maximum	$276.40	$337.47	$919.16	$471.52
Average	$120.26	$129.07	$234.35	$173.48

Source: FAA Form 127 and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

66 Resource Guide to Airport Performance Indicators

CN K-4
Concessions

FBO Revenue to the Airport – Change over Prior Period

Definition

Revenue to the airport provided by FBOs.

Data Sources

Airport records

Applicability

All airports where FBO revenue is important, especially GA and smaller commercial airports

Comments

Fuel sales are the largest source of revenue for most FBOs. Other sources of revenue include maintenance, hangar rentals, charters, tie-downs, and aircraft sales. Because the margins on each activity are likely to be different, measuring net revenue to the airport from FBO sales may provide a more useful single indicator than gross sales by the FBO. Tracking gross sales in the major categories may also be useful, especially fuel sales and hangar rentals. As to FBO revenues at reliever airports, the measure would be influenced by a governing body policy decision to keep fuel prices low at the relievers to attract activity away from the air carrier airport.

Useful for self-benchmarking, also peer benchmarking with similarly-situated airports.

Copyright National Academy of Sciences. All rights reserved.

Concessions – Other APIs

No.	Indicator Name	Definition
CN O-1	Advertising Services Revenue to Airport	Advertising services revenues received by airport
CN O-2	Concession Area per 1,000 Enplanements	Concession area per 1,000 enplanements. Generally limited to terminal concessions.
CN O-3	Concession Net Concession to Airport as Percentage of Gross Concession Sales	Concession Net Revenue received by the airport divided by Gross Concession Sales
CN O-4	Concession Revenue as a Percentage of Total Airport Revenue	Concession revenue received by the airport as a percentage of total airport revenue
CN O-5	Concession Services Gross Sales	Gross sales of concession services, such as ATM, WI-FI, Phone
CN O-6	Duration of Terminal Concession Leases	Duration of agreements with principal concessionaires or master concessionaire in food & beverage, retail/news/gift
CN O-7	Duty-Free Gross Sales	Duty-free concession gross sales
CN O-8	Duty-Free Net Revenue to Airport	Duty-Free Net Revenue received by the Airport
CN O-9	Duty-Free Gross Sales per International Departing Passenger	Duty-free gross sales per international departing passenger
CN O-10	Food & Beverage – Pricing	Price level of food & beverage offerings, generally compared with "street pricing"
CN O-11	Food & Beverage – Quality	Quality of food & beverage offerings, measured multiple ways
CN O-12	Food & Beverage – Range of Offerings	Measures range of food & beverage offerings against what a "typical" passenger would expect to find
CN O-13	Food & Beverage Gross Sales	Food & beverage gross sales
CN O-14	Food & Beverage Net Revenue to Airport	Food & Beverage Net Revenue received by the Airport
CN O-15	Hotel Net Revenue to Airport	Hotel net revenue received by the airport
CN O-16	News & Gift – Pricing	Measures price level of news & gift offerings, generally compared with "street pricing"
CN O-17	News & Gift – Quality	Measures quality of news & gift offerings
CN O-18	News & Gift – Range of Offerings	Measures range of news & gift offerings against what a "typical" passenger would expect to find
CN O-19	News & Gift Concession Gross Sales	News & gift concession gross sales
CN O-20	News & Gift Concession Net Revenue to Airport	News & Gift Concession Net Revenue received by the airport
CN O-21	Other Concession and Development Net Revenues to Airport	Golf course, racetracks, ball fields, farming, oil & gas – Net Revenue received by the airport
CN O-22	Other Concessions (Specialty Retail, Duty Free, Services) – Pricing	Price level of other specified concessions offerings, generally compared with "street pricing"
CN O-23	Other Concessions (Specialty Retail, Duty Free, Services) – Quality	Measures quality of other specified concessions offerings
CN O-24	Other Concessions (Specialty Retail, Duty Free, Services) – Range of Offerings	Measures range of other specified concessions offerings against what a "typical" passenger would expect to find
CN O-25	Rental Car Revenue Gross Sales	Rental car revenue gross sales
CN O-26	Rental Car Revenue Net Revenue to Airport	Rental car revenue net revenue received by the airport
CN O-27	Rental Car Revenue to Airport per Enplanement	Rental car revenue to airport per enplanement
CN O-28	Specialty Retail Gross Sales	Specialty retail gross sales

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
CN O-29	Specialty Retail Net Revenue to Airport	Specialty retail net revenue received by the airport
CN O-30	Taxi Revenues to Airport	Taxi Revenues received by the airport
CN O-31	Terminal Concession Area in Use – Post-Security	Terminal concession area in use for concession activity – post-security
CN O-32	Terminal Concession Area in Use – Pre-Security	Terminal concession area in use for concession activity – pre-security
CN O-33	Terminal Concession Gross Sales	Total terminal concession gross sales
CN O-34	Terminal Concession Net Revenues to Airport per O&D Enplanement	Terminal Concession Net Revenues received by the airport per O&D Enplanement
CN O-35	Total Terminal Area Dedicated to Concessions	The area the airport has dedicated to concessions, whether in active use or not
CN O-36	Total Terminal Concession Area in Use	Total terminal concession area in use
CN O-37	Transportation Services Net Revenue to Airport	Transportation services net revenue to airport
CN O-38	WI-FI Gross Sales	WI-FI gross sales

Copyright National Academy of Sciences. All rights reserved.

Energy Management (EN)

Energy management performance measures are used primarily to track energy consumption of various aspects of the airport, as well as the conversion of equipment to more energy-efficient & environmentally sound versions.

Key Indicators

Airfield Electricity Consumption – Change over Prior Period ..... EN K-1
Airport Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) ..... EN K-2
Renewable Energy Generated by the Airport (%) ..... EN K-3
Renewable Energy Purchased by the Airport (%) ..... EN K-4
Tenant Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) ..... EN K-5
Terminal Building Electricity Consumption per Square Foot – Change over Prior Period ..... EN K-6
Utilities/Energy Cost, Airport Total – Change over Prior Period ..... EN K-7
Utilities/Energy Cost per Square Foot of Terminal Building ..... EN K-8

Related Core and Key Indicators

Environmental

Carbon Footprint ..... EV K-1
LEED Building Projects – % New Building Projects Being Built to LEED Standards ..... EV K-3

See Other Indicators in ..... ***Airfield Operations, Environmental, Maintenance, Planning/Construction, Terminal Operations***

Comments

- Traditional energy measures include utilities cost per square foot of terminal space, as well as total utilities costs.
- In addition, airports may focus on actual energy usage in KwH or Btu, which removes the impact of changes in market prices.
- A variety of recent environmentally focused energy measures are coming into wider use, including those focusing on the percentage of energy consumed from renewable sources. Wider usage will increase the opportunities for peer benchmarking.
- Check Environmental APIs as well.

Copyright National Academy of Sciences. All rights reserved.

EN K-1
Energy Management

Airfield Electricity Consumption – Change over Prior Period

Definition

Increase or decrease in annual KwH for the airfield.

Data Sources

Airport records

Applicability

All airports

Comments

Measures electricity consumption for the airfield. One way in which airports are working to reduce airfield energy consumption is to convert to LED airfield lighting.

A U.S. Air Force RFI for airfield taxiway lighting issued in May 2010 observes:

> Current airfield lighting, which is typically quartz/incandescent, is inefficient in terms of energy consumption and associated costs for illumination and also has higher greenhouse gas emissions compared to the new LED alternative(s). Further, there is a higher cost for operations and maintenance associated with airfield taxiway incandescent lamps and fixtures based on their energy consumption and life expectancies. There is also the potential that LEDs could improve the situational awareness and level of guidance to the pilots since LEDs have a greater intensity, which could reduce the amount of incursions and accidents during periods of darkness and low visibility.
>
> Source: (https://www.fbo.gov/notices/d3325ce12111cd91e6c080f2d7eb0b59)

Useful for self-benchmarking. Due to data issues less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

EN K-2
Energy Management

Airport Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%)

Definition

Percentage of airport vehicles and ground service equipment converted to energy-efficient types. Excludes vehicles operated by airlines and other tenants.

Data Sources

Airport records

Applicability

All airports

Comments

An indicator of airport efforts to reduce energy consumption. Alternative fuels, including compressed natural gas (CNG), liquefied natural gas (LNG), electricity, ethanol, methanol, propane and even vegetable oils, are chemically less complex than gasoline and burn "cleaner," with fewer emissions. Many airports have decided to convert to more energy-efficient vehicles and ground service equipment. Some airports track absolute fuel consumption as opposed to vehicle conversion as this permits a continued focus on fossil fuel reduction even after vehicles have been converted.

Useful for self-benchmarking. Due to data issues less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

72 Resource Guide to Airport Performance Indicators

EN K-3
Energy Management

Renewable Energy Generated by the Airport (%)

Definition

Amount of renewable energy generated by the airport, as a percentage of total energy consumed by the airport.

Data Sources

Airport records

Applicability

All airports

Comments

Part of the evolving set of environmentally-oriented energy measures being developed, with accompanying data collection issues. At airports such as Denver, Oakland, and Boston, renewable energy is generated on-site through technologies such as solar photovoltaic panels or wind turbines. See ACI-*NA Going Greener, Minimizing Airport Environmental Impacts* for further information on ongoing airport initiatives.

Example

The Fresno Yosemite International Airport has incorporated several environmental programs including a 2 megawatt solar system that will generate over 4.2 megawatt hours of power at zero cost to the airport with a projected energy cost savings of $13 million over the next 25 years; recycling 100 percent of removed material from airport projects; a rehabilitated terminal facility with a 20 percent projected reduction in energy consumption through passive solar design, redesigned energy efficient lighting and mechanical systems, use of cool roofs and recycled materials; an on-going residential noise mitigation program; and a consolidated rental car facility which reduces vehicle jockeying and eliminates the need for customer busing.

Source: ACI-NA Going Greener and www.fresno.gov/DiscoverFresno/Airports/default.htm

Useful for self-benchmarking. Due to data issues less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

EN K-4
Energy Management

Renewable Energy Purchased by Airport (%)

Definition

Amount of renewable energy purchased by the airport, as a percentage of total energy consumed by the airport. Excludes energy purchases by tenants.

Data Sources

Airport records

Applicability

All airports

Comments

Part of the evolving set of environmentally-oriented energy measures being developed, with accompanying data collection issues. Becoming an important measure for some airports. Press reports (as of June 2010) list DFW – with a commitment to purchase 20% of its electricity from renewable sources – as ranking #9 on the U.S. EPA's list of top governmental purchasers of green energy. Also, PHL is reported to have committed to purchase wind power meeting 7% of airport's electricity needs.

Note that not every jurisdiction defines renewable energy the same way. For example, 100% of the power that Sea-Tac Airport purchased in 2010 is from non-fossil fuel generating sources, primarily hydropower. Yet under Washington State law, large hydro is not considered renewable energy. There are similar issues with biomass and waste to energy generation, fuel cells, etc.

For purposes of this definition, all of the traditional renewable energy sources are included, such as traditional biomass, hydropower, solar, geothermal, and wind. See *Renewables 2010 Global Status Report* for information on renewable energy usage around the world.

Useful for self-benchmarking. Due to data issues less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

EN K-5
Energy Management

Tenant Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%)

Definition

Percentage of tenant vehicles and ground service equipment converted to energy-efficient types.

Data Sources

Airport records

Applicability

All airports

Comments

An indicator of tenant efforts to reduce energy consumption. Obtaining data from tenants may present difficulties. Alternative fuels, including compressed natural gas (CNG), liquefied natural gas (LNG), electricity, ethanol, methanol, propane and even vegetable oils, are chemically less complex than gasoline and burn "cleaner," with fewer emissions. Some airports are mandating that tenants convert to more energy-efficient vehicles and ground service equipment. Some airports track absolute fuel consumption as opposed to vehicle conversion as this permits a continued focus on fossil fuel reduction even after vehicles have been converted. See description of Oakland activities below.

Example

Oakland International Airport Ground Service Equipment Alternative Fuel Program

Ground Service Equipment (GSE) refers to the vehicles that provide service to aircraft while at the gate. These include baggage loaders, forklifts, food service vehicles, tugs and baggage carts. Most of the current GSE run on gasoline or diesel fuel. OAK is committed to working toward converting the entire GSE fleet to alternative fuel to mitigate the potential increase in air emissions by 2010.

Electric power for GSE has been installed at each of the seven (7) new gates (26 through 32) recently constructed as a part of the Terminal 2 Extension project. Southwest Airlines is installing rapid battery chargers and will begin using electric baggage loaders. We expect that by July 2008 each airline will have a plan in place for using electric GSE.

http://www.flyoakland.com/noise/environmental_airquality.shtml

Useful for self-benchmarking. Due to data issues less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

EN K-6
Energy Management

Terminal Building Electricity Consumption per Square Foot – Change over Prior Period

Definition

Change in electricity consumption in KwH per square foot over prior year.

Data Sources

Airport records

Applicability

All airports

Comments

Measures the change in electricity usage per square foot of terminal space. This measure may provide a better indicator of energy usage than Utilities/Energy Cost per Square Foot of Terminal Buildings EN K-8 as costs can rise and fall based on unrelated market conditions. In general, terminals consume the largest portion of utilities/energy at the airport. Also, at most airports, utilities and energy costs are included with the terminal rent charged to tenants, whereas utilities charged for other rented buildings are typically metered and billed separately to the tenants. May be useful to track heating and cooling degree days to provide baseline to determine track efficiency and cost changes using common baseline.

Useful for self-benchmarking; useful for peer benchmarking against airports with similar terminal facilities.

Copyright National Academy of Sciences. All rights reserved.

EN K-7
Energy Management

Utilities/Energy Cost, Airport Total – Change over Prior Period

Definition

Increase or decrease in annual utilities and energy cost for the airport.

Data Sources

Airport records. Note: FAA Form 127 combines communications and utilities.

Applicability

All airports

Comments

Measures utilities and energy costs, which are major components of airport operating costs. See *ACRP Research Results Digest 2, Model for Improving Energy Use in U.S. Airport Facilities*, December 2007, which contains useful discussion of energy/utilities cost metrics, including normalizing factors used in peer benchmarking. The Digest notes, e.g., that energy costs should always be normalized for variations in average annual outside air temperature using historical weather data. It also points out that:

> The amount of energy use per unit of conditioned space (square foot) is the most commonly used factor for benchmarking building energy performance. Percentage of conditioned space is not always accurate for very large airport facilities because the number of enplanements varies widely, and airports often have a large percentage of mixed-use space. Some airports also have large cargo areas that are not conditioned or are only partially conditioned. Digest, p. 8.

Useful for self-benchmarking and peer benchmarking.

Example

Potential Energy Indices Based on the Airport O&M Best Practices Survey (December 2006 to January 2007)

Group	Utility Costs/ft2	Energy Costs/ft2	Utility Costs/ Enplanement	Energy Costs/ Enplanement	Enplane-ments/ft2
Airports Overall	$2.71	$2.55	$1.05	$0.99	2.57
Large Airports	$2.79	$2.63	$1.03	$0.97	2.71
Medium Airports	$1.63	$1.53	$1.55	$1.46	1.05
Small Airports	$3.11	$2.98	$1.88	$1.80	1.65

Source: *ACRP Research Results Digest 2, Model for Improving Energy Use in U.S. Airport Facilities, December 2007,* Table 3, p. 8.

Copyright National Academy of Sciences. All rights reserved.

EN K-8
Energy Management

Utilities/Energy Cost per Square Foot of Terminal Building

Definition

Utilities and energy cost per square foot of terminal building.

Data Sources

Airport records

Applicability

All airports

Comments

Measures utilities and energy costs per square foot of terminal space. In general, terminals consume the largest portion of utilities/energy at the airport. Also, at most airports, utilities and energy costs are included with the terminal rent charged to tenants, whereas utilities charged for other rented buildings are typically metered and billed separately to the tenants. May be useful to track heating and cooling degree days to provide baseline to determine track efficiency and cost changes using common baseline.

Useful for self-benchmarking, useful for peer benchmarking against airports with similar terminal facilities.

Copyright National Academy of Sciences. All rights reserved.

Energy Management – Other APIs

No.	Indicator Name	Definition
EN O-1	Airfield Energy Consumption – Lighting, etc.	Airfield energy consumption in Kwh – lighting, etc.
EN O-2	Amount of Renewable Energy Purchased by Airport Tenants	Amount of renewable energy purchased by airport tenants
EN O-3	Annual Terminal Complex Energy Consumption	Annual terminal complex energy consumption
EN O-4	Electric Cost per Enplanement	Total airport electricity cost per enplaned passenger
EN O-5	Electric Cost per Terminal Bldg Area With Electric Service (s.f.)	Cost of electricity in terminal area per terminal building area with electric in s.f.
EN O-6	Electricity Consumption – Annual	Total airport electricity consumption per year in Kwh
EN O-7	Electricity Consumption per Square Foot of Terminal – Annual	Electricity consumption per square foot per year in Kwh
EN O-8	Energy Consumption per Square Foot of All Airport Buildings	Energy consumption per square foot of all airport buildings in Kwh
EN O-9	Energy Consumption per Square Foot of Terminal Area	Energy consumption per square foot of terminal area in Kwh
EN O-10	Energy Costs per Enplanement	Total airport energy costs per enplanement
EN O-11	Energy-Efficient Entryways in Airport-Owned/Operated Buildings – Percentage of	Percentage of energy-efficient entryways in airport-owned/operated buildings
EN O-12	Energy-Efficient Lighting in Use – Airport Wide – Percentage of	Percentage of energy-efficient lighting in use – airport wide
EN O-13	Energy-Efficient Lighting in Use in Terminals – Percentage of	Percentage of energy-efficient lighting in use in terminals
EN O-14	Energy-Efficient Windows in Airport-Owned/Operated Buildings – Percentage of	Percentage of energy-efficient windows in airport-owned/operated buildings
EN O-15	Fossil Fuel to Total Fuel Usage – Percentage of	Percentage of fossil fuel usage to total fuel usage
EN O-16	Fuel Consumption of Airport Vehicles	Total fuel consumption of GSE and other vehicles based at the airport, operated by the airport operator and tenants. Change year-over-year in gallons.
EN O-17	Heating & Cooling Degree Days	Index designed to measure amount of heating and cooling required for particular locations
EN O-18	HVAC Equipment Meeting Energy-Efficiency Guidelines – Percentage of	Percentage of HVAC equipment meeting energy-efficiency guidelines
EN O-19	Landside (Excl. Terminals) Energy Consumption	Landside energy consumption in kwh excluding terminals
EN O-20	Nuclear Energy Used on Airport – Percentage of	Percentage of nuclear energy used on airport compared to total airport energy used
EN O-21	Renewable Energy Compared to Total Energy Consumption, Airfield – Percentage of	Percentage of renewable energy used on airfield compared to total energy consumption on airfield
EN O-22	Renewable Energy Compared to Total Energy Consumption, Landside (Excl. Terminals) – Percentage of	Percentage of renewable energy used on landside compared to total energy consumption used on landside (excluding terminals)
EN O-23	Renewable Energy Used on Airport – Percentage of	Percentage of renewable energy (e.g., hydropower, wind energy, solar energy) used on airport compared to total airport energy used

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
EN O-24	Renewable Energy Utilized Compared to Total Energy Consumption, Terminal Complex – Percentage of	Percentage of renewable energy used in the terminal complex compared to total energy consumption in the terminal complex
EN O-25	Terminal Electric Cost	Total electric service cost for terminal
EN O-26	Terminal Utilities Cost per Terminal Building Area with Utility Service (s.f.)	Total cost of terminal utilities per terminal building area with utility service (s.f.)
EN O-27	Total Utilities/Energy Cost – Terminal Buildings – Change over Prior Period	Total utilities/energy cost – terminal buildings – change over prior period
EN O-28	Total Airport Electric Cost	Total cost of electric service for the airport
EN O-29	Total Airport Energy Consumption	Total energy consumption for the airport (electricity, heating energy, cooling energy)
EN O-30	Total Airport Utilities Cost	Total cost of airport utilities
EN O-31	Utility Costs per Enplanement	Total airport utility costs per enplanement
EN O-32	Utility Costs per Square Footage – Terminal Complex	Total terminal complex utility costs per terminal square foot

Copyright National Academy of Sciences. All rights reserved.

Environmental (EV)

Environmental performance measures are used to track a variety of environmental indicators relating to emissions, discharges, noise, use of green building and other environmental sound practices, environmental violations, etc.

Key Indicators

Carbon Footprint ..... EV K-1
Deicing – % Fluid Recovered ..... EV K-2
LEED Building Projects – % New Building Projects Being Built to LEED Standards ..... EV K-3
Environmental Reviews – Timeliness of Completion ..... EV K-4
Environmental Violations – Number of NOVs ..... EV K-5
Night Operations – % Using Preferential Runways ..... EV K-6
Noise Abatement Procedures – % Compliance ..... EV K-7
Noise – Number of Homes within 65 dBA DNL ..... EV K-8
Reportable Discharges, Number ..... EV K-9
Stage 2 Operations < 75,000 Lbs ..... EV K-10
Waste Recycling ..... EV K-11

Related Core and Key Indicators

Energy Management

Airfield Electricity Consumption – Change over Prior Period ..... EN K-1
Airport Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) ..... EN K-2
Renewable Energy Generated by the Airport (%) ..... EN K-3
Renewable Energy Purchased by the Airport (%) ..... EN K-4
Tenant Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%) ..... EN K-5

See Other Indicators in ..... ***Energy Management, Maintenance, Public Affairs, Safety/Risk Management***

Comments

- To date, the strong interest in environmental responsibility has not resulted in a set of commonly accepted environmental performance indicators.
- Note also that a variety of recent environmentally focused energy measures are coming into wider use, including those focusing on the percentage of energy consumed from renewable sources.
- Some environmental measures are a matter of regulatory compliance at the state level and therefore not likely good candidates for broad benchmarking.

Copyright National Academy of Sciences. All rights reserved.

82 Resource Guide to Airport Performance Indicators

EV K-1
Environmental

Carbon Footprint

Definition

The carbon footprint is the total set of greenhouse gases (GHG) emissions caused by activities at the airport, expressed in terms of the amount of carbon dioxide or its equivalent in other GHGs, emitted.

Data Sources

Airport studies

Applicability

All airports, but of particular importance for larger airports

Comments

Airports are beginning to focus on this API, which is not easy to track and requires the use of models for which there is yet no industry standard. See European Commission document: "Carbon Footprint – What It Is and How to Measure It". Note also ISO 14040 provides information on carbon footprint calculations. See *ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories,* which provides a framework for identifying and quantifying specific components of airport contributions to greenhouse gases:

> This guidebook can be used by airport operators and others to prepare an airport-specific inventory of greenhouse gas emissions. It identifies calculation methods that can be applied consistently, improving comparability among airports and enhancing understanding of relative contributions of greenhouse gases to local environments. The inventory methods presented focus on the six primary greenhouse gases: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons. As part of the methodology, the guidebook provides instructions on how to calculate emissions from specific sources and how to create carbon dioxide (CO2) equivalencies. [Foreword to Report]

Airports control a relatively small portion of total GHG emissions associated with the use of their facilities, and therefore may separately measure GHG emissions in multiple categories, as is the case for Sea-Tac, which has established the following goals:

> *Port Owned/Controlled Emissions*: By 2020, reduce emissions by 15% below 2005 levels.
>
> *Airline Owned/Controlled emissions:* Work with airline partners to identify and implement cost effective emission reduction strategies.
>
> *Public Owned/Controlled Emissions:* Assist the state and local governments in meeting the statewide transportation specific climate goal of reducing total vehicle miles traveled 18% by 2020, 30% by 2035 and 50% reduction by 2050.
>
> Source: *Seattle-Tacoma International Airport Environmental Strategy Plan 2009.*

Useful for self-benchmarking. In the future, may become useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

EV K-2
Environmental

Deicing – % Fluid Recovered

Definition

Percent of aircraft deicing fluid that is captured/recovered.

Data Sources

Airport records

Applicability

All airports with deicing

Comments

Deicing operations include removal of ice from aircraft, application of chemicals to prevent initial icing or further icing (anti-icing), and removal of (and preventing) ice from airfield pavement (runways, taxiways, aprons and ramps). This indicator measures the percentage of undiluted aircraft deicing fluid (ADF) that is captured after being sprayed. In 2009, EPA proposed to set national standards for control of wastewater discharges from deicing operations at airports, including setting minimum percentages for ADF recovery for different airports. [As of December 2010, that proposal is pending.] Regulatory implications may make obtaining peer data difficult.

Apart from complying with minimum standards that may be set by federal law, this API is a useful environmental measure, which may be used for self-benchmarking and to peer-benchmark with similarly-situated peer airports. The facilities used for deicing and deicing fluid recapture vary from airport to airport, and must be considered in any comparison of fluid recovery between airports.

Example

Excerpt from Denver International Airport
2009 Environmental Performance Report Card

Target: Maintain an aircraft deicing fluid (ADF) applied-to-collected ratio of 69 percent

Metric = total gallons of ADF used/gallons captured
Baseline 2004-2005 season = 69 percent. DIA has consistently maintained an ADF applied-to-collected ratio of 69 or 70 percent.

2008-2009 DEICING SEASON

Total ADF Applied = 1,241,093 gallons
Total ADF Collected = 868,765 gallons

Of the 70 percent collected:
- 622,776 gallons of ADF were reclaimed (72 percent)
- 209,187 gallons of ADF were sent to Metro Wastewater (24 percent)

Source: Denver International Airport website

Copyright National Academy of Sciences. All rights reserved.

EV K-3
Environmental

LEED Building Projects – % of New Building Projects Being Built to LEED Standards

Definition

Percent of new building projects being built to LEED standards. LEED is "Leadership in Energy and Environmental Design."

Data Sources

Airport records

Applicability

All airports

Comments

LEED standards, promulgated by the U.S. Green Building Council, are being applied on a voluntary basis by more and more airports. It is important to note that there are: (a) different categories of LEED standards, e.g., LEED for New Construction and Major Renovations, LEED for Commercial Interiors, and LEED for Existing Buildings Operation & Maintenance; and (b) different levels of certification ranging from certified to silver to gold to platinum. Therefore, it is important to track not only the number of LEED certified projects, but the category and level of certification.

An increasing number of airports require that new projects be built to LEED standards. In the future, as the volume of LEED-certified projects grows, airports may consider converting this API to a measure of actual percentage of building square footage that meets specified LEED standards.

Useful for self-benchmarking, not as useful for peer benchmarking.

Example

All New Office Depot Stores Aim for LEED Certification

To attain LEED certification for its new stores, Office Depot plans to use a range of Energy Star and energy efficient equipment, appliances and lighting along with an energy management system that tracks energy use and trends. The stores' other features will include skylights where possible to brighten up as much as 90 percent of a store, reflective roofs that allow the interiors of stores to stay cooler, a range of water-conserving fixtures, recycling of construction waste where possible, 50 percent of its wood from Forest Stewardship Council certified sources and purchases of renewable energy.

Source: Office Depot Press Release, February 22, 2010

Copyright National Academy of Sciences. All rights reserved.

EV K-4
Environmental

Environmental Reviews – Timeliness of Completion

Definition

Actual versus planned duration of environmental review process for major development projects.

Data Sources

Airport records, FAA environmental decisions

Applicability

All airports

Comments

The duration of the environmental review process is a critical factor in planning and managing major development projects. When environmental reviews are not completed on schedule, the project is delayed. The FAA is the lead federal agency for airport projects and subject to NEPA (National Environmental Policy Act) requirements. Delays in FAA environmental decision-making may occur for multiple reasons, including the need for additional evaluation because of insufficient information.

This is a far-from-perfect performance indicator in a critical but very difficult to control area. Environmental reviews may take longer than anticipated for numerous reasons, including those within the airport's control, e.g., insufficient preparation, and those beyond its control, e.g., external controversies leading to major litigation or protracted agency review.

For further discussion of this important and complex subject, see TRB Synthesis Report 17, *Approaches to Integrating Airport Development and Federal Environmental Review Processes (2009).*

This API is of most value in self-benchmarking, where an airport is conducting multiple projects requiring environmental review. The duration of the environmental review process for a major project at one airport may also be peer-benchmarked for similar projects at other airports with similar environmental issues.

Copyright National Academy of Sciences. All rights reserved.

EV K-5
Environmental

Environmental Violations – Number of NOVs

Definition

Number of environmental notices of violation annually – divided into NOVs for releases or discharges that exceed permit limits, and all other NOVs.

Data Sources

Airport records

Applicability

All airports

Comments

A number of airports track the number of notices of environmental violations received, with the goal of receiving no notices of violation. Some airports track NOVs in which the airport is charged with having made an actual discharge or release in excess of permit limits separately from "paperwork"-type NOVs.

Because the subject and severity of these notices may vary widely, and airports in different locations are subject to different state environmental laws, this API is best used for self-benchmarking, not for peer benchmarking. Regulatory implications may make obtaining peer data difficult.

Example

Ted Stevens Anchorage International Airport
Performance and Results Summary

Target #1: Zero environmental Notices of Violation (NOVs).
Status #1: For the sixth year in a row the Anchorage Airport had no NOVs for environmental issues.

Number of environmental Notice of Violations

Fiscal Year	Number
FY 2008	0
FY 2007	0
FY 2006	0
FY 2005	0
FY 2004	0
FY 2003	0

Analysis of results and challenges: Anchorage International Airport must comply with all environmental regulations, including activities, property and facilities managed by the airport.

Source: gov.state.ak.us/omb/results/view_details.php?p=220

Copyright National Academy of Sciences. All rights reserved.

EV K-6
Environmental

Night Operations – % Using Preferential Runways

Definition

Percent of time preferential runways are used during night operations. A preferential runway is the runway that when used, would have the least noise impact on the surrounding communities.

Data Sources

Airport records

Applicability

All airports with preferential night runways

Comments

A majority of noise complaints relate to night operations. Airports with preferential night runways typically set a target for the percentage of night operations that use the preferential runways. This API is important for airports to self-benchmark. It is of limited use in peer benchmarking.

Example

Ted Stevens Anchorage International Airport
Performance and Results Summary

Target #1: Minimize noise impact on surrounding communities through the use of preferential runways for at least 75% of the night operations at the airport.

Percent of departures using preferential runways

Fiscal Year	Total
FY 2008	77%
FY 2007	73%
FY 2006	75%
FY 2005	75%
FY 2004	100%

Source: gov.state.ak.us/omb/results/view_details.php?p=220

Copyright National Academy of Sciences. All rights reserved.

88 Resource Guide to Airport Performance Indicators

EV K-7
Environmental

Noise Abatement Procedures – % Compliance

Definition

Percent of operations that comply with noise abatement procedures.

Data Sources

Airport records

Applicability

All airports with noise abatement procedures

Comments

Many airports have noise abatement procedures to reduce the noise produced by aircraft while on the ground, during takeoffs and landings, and during flights over populated areas. Some airports have multiple noise monitoring stations, others monitor flight paths including, deviations from planned routings. Areas of non-compliance may include engine runups, altitude, route/track, noise levels.

Example

Oakland International Airport North Field
VFR Aircraft Departure Procedures
Sample Compliance Report

VFR Aircraft Departure Procedure Performance Report Summary Fourth Quarter 2006				
	Runway 27R	Runway 27L	Runway 33	Total
Total VFR Departures	737	70	1,010	1,817
Total VFR Departures Over Alameda	132	11	66	209
Percentage of Total VFR Departures Over Alameda	18%	16%	7%	12%
Non-compliant VFR Departures Over Alameda	41	1	20	62
Compliant VFR Departures	696	69	990	1,755
Percentage of VFR Departure Compliance	94%	99%	98%	97%
IFR Departures	2,563	487	624	3,674
Total Departures	3,300	557	1,634	5,491
Compliance Percentage of Total Departures	99%	100%	99%	99%

Source: Oakland International Airport website

Copyright National Academy of Sciences. All rights reserved.

EV K-8
Environmental

Noise – Number of Homes within 65 dBA DNL

Definition

Number of homes subjected to noise resulting from aviation activities of 65 dBA DNL or above.

Data Sources

Airport records; Part 150 and other environmental studies

Applicability

All airports

Comments

The FAA defines significant noise exposure as occurring at 65 dBA DNL and above. Airport noise compatibility programs are usually based on establishing or maintaining compatible land uses in areas at or above that noise level. The FAA also recognizes CNEL (community noise equivalent level) as an alternative metric in California. Noise models are used to develop noise exposure contours and noise exposure maps submitted to the FAA and state and local government agencies. The Integrated Noise Model (INM) is the most commonly applied aviation noise model.

It is important for airports to measure and track the number of homes subjected to 65 dBA DNL. An alternative or supplemental measure is to track the number of people subjected to 65 dBA DNL. Useful for self-benchmarking. Because each airport is situated differently with respect to nearby homes, its use for peer benchmarking would be mainly on a macro level to highlight airports with similar noise issues.

Copyright National Academy of Sciences. All rights reserved.

90 Resource Guide to Airport Performance Indicators

EV K-9
Environmental

Reportable Discharges, Number

Definition

Number of reportable quantity discharges of hazardous substances and petroleum products.

Data Sources

Airport records

Applicability

All airports

Comments

Covers reportable spills of hazardous substances and petroleum products such as cleaning fluids, waste oil, paint, solvents, gasoline, etc. Petroleum product spills may have different reporting standards than substances. State requirements regarding spill reporting vary. Many states use the lists of chemicals and reportable quantities developed under federal laws dealing with waste management and water pollution. A few states require reporting of any spill amount, sometimes only for oil, while relying on federal law to determine minimum reportable quantities for other substances. Some states have a subjective standard which requires reporting of spills which may cause environmental, public health or public safety problems.

Because of differences between states, this API is better used for self-benchmarking than peer benchmarking. though substantial differences between the number of reportable spills at one airport versus other airports should attract management attention.

Copyright National Academy of Sciences. All rights reserved.

EV K-10
Environmental

Stage 2 Operations < 75,000 Lbs

Definition

Number of Stage 2 operations conducted with aircraft less than 75,000 lbs.

Data Sources

Airport records

Applicability

All airports, but of particular concern to airports handling business jets

Comments

Stage 2 aircraft of 75,000 lbs or more were phased out by 2000. However, Stage 2 operations are generally still permitted by aircraft under 75,000 lbs. Operations by these aircraft generate a disproportionate number of noise complaints and other community concerns. As of 2005, approximately 150 airports had a significant number of Stage 2 operations conducted with Lear, Gulfstream, Sabreliner, Falcon and other jet aircraft.

Useful for self-benchmarking, also peer benchmarking similarly situated airports.

Copyright National Academy of Sciences. All rights reserved.

92 Resource Guide to Airport Performance Indicators

EV K-11
Environmental

Waste Recycling

Definition

Percentage of total tons of solid waste that is recycled/reused/composted excluding construction/demolition waste, restaurant grease, glycol.

Data Sources

Airport studies

Applicability

All airports

Comments

Measures solid waster recycling rate. For example, Seattle-Tacoma International Airport reports in its 2010 Progress Report that it will "increase the solid waste recycling rate from the current 21% in 2008 to 50% by 2014." Separate recycling goals may be set for different types of waste, including construction debris, pre-consumer organics, and post-consumer compostables, as well as airfield trash.

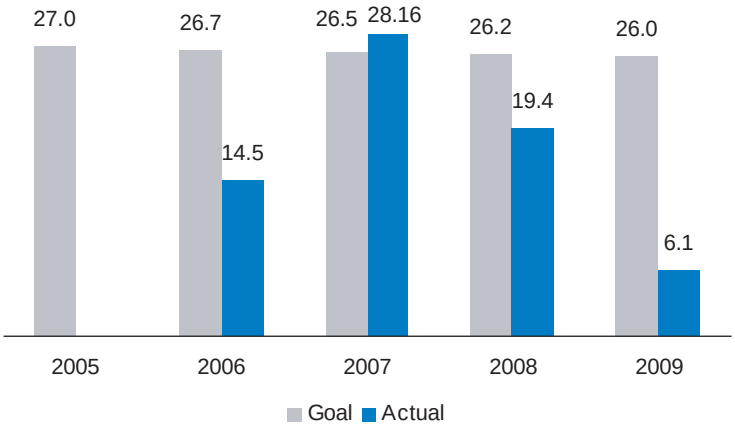
Useful for self-benchmarking, not as useful for peer benchmarking.

Example

Excerpt from Denver International Airport 2009 Environmental Performance Report Card

Target: Decrease the amount of city-generated hazardous waste by 1 percent annually (note: excludes universal waste).

Denver International Airport, City-Generated Hazardous Waste, Pounds per Year per Million Passengers



Source: Denver International Airport web site and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

Environmental – Other APIs

No.	Indicator Name	Definition
EV O-1	Aircraft Operations in Compliance with Approved Voluntary Flight Track Programs (%)	Ratio of operations complying with approved, voluntary flight track program
EV O-2	Aircraft Parking Positions Serviced by a Hydrant Fuel System (%)	Percentage of Aircraft Parking Positions Serviced by a Hydrant Fuel System
EV O-3	Buildings On-Airport That Are LEED Certified (%)	Ratio of buildings that are "green"
EV O-4	Certification Status of Environmental Management System	Certification Status of Environmental Management System
EV O-5	Construction & Demolition Waste Recycled/Reused/Composted (%)	Percentage of construction & demolition waste that is recycled/reused/composted (in tons)
EV O-6	Deicing Fluid Discharges per Total Deicing Operation – Total Airport	Percentage of deicing discharges per total number of deicing operations – all operators
EV O-7	Direct CO_2 Emissions	Direct CO_2 emissions – Scope 1 Greenhouse Gas protocol standards for fuels, etc.
EV O-8	Environmental Program Capital Budget	Environmental Program Capital Budget
EV O-9	Environmental Program Operating Budget	Environmental Program Operating Budget
EV O-10	Existence of Environmental Management System	Existence of Environmental Management System
EV O-11	Flights in Compliance with Noise Abatement Procedures (%)	Aircraft operations complying with noise-program procedures compared to total flights
EV O-12	Fuel Discharges per Total Fueling Operations – Total Airport	Percentage of fuel discharges per total number of airport fueling operations
EV O-13	Homes in 65 Ldn That Have Avigation Easements Attached (%)	Percentage of noise -impacted homes with avigation easements in 65 Ldn area
EV O-14	Homes in 65 Ldn That Have Been Mitigated (%)	Percentage of noise-mitigated homes in 65 Ldn area
EV O-15	Homes Subjected to Specified Noise Level (%)	Percentage of homes subjected to a specified noise level
EV O-16	Indirect CO_2 Emissions	Indirect CO_2 emissions (Scope 2 Greenhouse Gas protocol standards: sourcing of power, etc.)
EV O-17	Landscaping That is "Xeriscape" Landscaping (%)	Percentage of landscaping that is "xeriscape" landscaping (i.e., doesn't require supplemental irrigation)
EV O-18	Landscaping Water Usage That Comes from a Water Re-Use/ Recapture Program (%)	Percentage of Landscaping Water Usage That Comes from a Water Re-Use/Recapture Program
EV O-19	Night Operations – Preferential Runways Used (%)	Percentage of night operations using preferential runways
EV O-20	Number of Aircraft Noise Complaints	Number of aircraft noise-related complaints
EV O-21	Number of Airport Patrons Utilizing Pay-On-Foot Parking	Pay-on-foot parking systems reduce idling time in automobiles
EV O-22	Number of Clean-Fuel Vehicles Owned by Airport	Clean-fuel vehicles owned by the airport. A measure of the airport's fleet modernization efforts.
EV O-23	Number of Flight Track Violations	Number of flights that exceed established noise level standards at monitoring stations
EV O-24	Number of LEED-Certified Buildings on Airport	Number of “green” airport buildings

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
EV O-25	Number of Staff Reporting to Environmental Manager	Staff reporting to airport environmental manager. A measure of airport commitment to environmental concerns.
EV O-26	Number of Tons of Construction and Demolition Waste Recycled/ Reused/ Composted	Number of tons of construction and demolition waste that is recycled/reused/composted
EV O-27	Number of Tons of Solid Waste Recycled/Reused/Composted	Number of tons of solid waste that is recycled/ reused/composted (excluding construction/demolition waste, restaurant grease, glycol)
EV O-28	Number of Violations of Airport Ground Run-Up Procedures	Number of aircraft operator violations of airport run-up procedures
EV O-29	Pay-On-Foot Parking Users to Total Number of Patrons Parking (%)	Percentage of pay-on-foot parking users to total number of patrons parking
EV O-30	Public Restroom Sinks Equipped with Automatic Shutoff/Water Flow Control Devices (%)	Percentage of public restroom sinks equipped with automatic shutoff/water flow control devices
EV O-31	Public Restroom Toilets with Low-Flow Devices (%)	Percentage of public restroom toilets with low-flow devices
EV O-32	Publication of Annual Environmental Report – Y/N	Whether the airport publishes an environmental report annually
EV O-33	Purchases Included in "Green Purchasing" Program as % of Eligible Purchases (%)	Percentage of eligible purchases included in "green purchasing" program
EV O-34	Reduction in Discharged De-Icing Material to Nearby Waterways (%)	Reduction in discharged de-icing material to nearby waterways (%)
EV O-35	Rental Car Fleet Comprised of Low-Emissions or Alternative Fuel Vehicles (%)	Ration of LEV/alternate fuel vehicles in the rental car fleet
EV O-36	Taxicabs Comprised of Low Emission or Alternative Fuel Vehicles (%)	Ratio of LEV/alternate fuel vehicles in the taxicab fleet
EV O-37	Tenants Inspected Annually for Environmental Compliance (%)	Percentage of tenants inspected annually for environmental compliance
EV O-38	Total Water and Sewer Cost	Total cost to the airport and tenants for water and sewer service
EV O-39	Waste and Disposables Recycled (%)	Percentage of waste and disposables recycled
EV O-40	Water & Sewer Cost per Enplanement	Cost of water & sewer services per enplaned passenger
EV O-41	Water & Sewer Cost per Terminal Bldg Area with Water & Sewer Service (S.F.)	Cost of water & sewer services per terminal area with water & sewer services
EV O-42	Water Consumption – Change over Prior Period	Water consumption – change over prior period
EV O-43	Water Consumption per Enplanement	Water consumption per enplaned passenger
EV O-44	Waterless Public Restroom Urinals and Toilets (%)	Percentage of public restroom urinals and toilets that are waterless
EV O-45	Weight of Waste/Disposables Recycled	Weight of waste/disposables recycled

Copyright National Academy of Sciences. All rights reserved.

Financial (FN)

Financial performance measures are used to track all aspects of an airport's financial performance, including revenues and costs for the airport in total and its various departments and functions.

Core Indicators

Airline Cost per Enplanement ..... FN C-9
Airport Cost per Enplanement ..... FN C-10
Bond Rating ..... FN C-11
Days Unrestricted Cash on Hand ..... FN C-12
Debt per Enplanement ..... FN C-13
Debt Service Coverage Ratio ..... FN C-14
Non-Aeronautical Operating Revenue as % of Total Operating Revenue ..... FN C-15
Non-Aeronautical Operating Revenue per Enplanement ..... FN C-16
Operating Cost per Enplanement ..... FN C-17

Key Indicators

Accounts Receivable Aging – Days ..... FN K-1
Airline Cost per Operation ..... FN K-2
Airport Revenue from Non-Passenger-Dependent Sources (%) ..... FN K-3
Contract Services Cost as % of Total Operating Cost ..... FN K-4
Debt Service as % of Operating Revenue ..... FN K-5
Investment Income as % of Invested Assets ..... FN K-6
Long-Term Debt per Enplanement ..... FN K-7
Net Operating Income per Enplanement ..... FN K-8
Net Working Capital (Operating Liquidity) ..... FN K-9
Operating Cost per Operation ..... FN K-10
Personnel Cost per Enplanement ..... FN K-11

Related Core and Key Indicators

See area of interest as many other Core and Key Indicators are related to the Financial indicators. For example:

ARFF

ARFF Cost – Change over Prior Period ..... AR K-1

Concessions

Concession Revenue to the Airport as % of Total Operating Revenue ..... CN C-6

Fuel

Fuel Sales Net Profit/Loss or Fuel Flowage Fees ..... FL K-1

See Other Indicators in ..... ***ARFF, Concessions, Fuel, General Aviation, Grants, Human Resources, Maintenance, Parking, Planning/Construction, Properties/ Contracts***

Comments

- Financial indicators are a primary focus for many airports, and are widely tracked and benchmarked. Airline Cost per Enplanement is probably the most widely used API.
- Although the primary collection of financial indicators is found in the Financial category, other important financial indicators are found in many other categories.

Copyright National Academy of Sciences. All rights reserved.

96 Resource Guide to Airport Performance Indicators

FN C-9
Financial

Airline Cost per Enplanement

Definition

Commonly referred to as CPE (Cost per Enplanement). Average of what airlines pay per enplanement to the airport for use of airfield (landing fees, ramp/apron fees) and terminal space (space rentals net of any credits and reimbursements, plus gate charges). Includes payments for aircraft parking positions (e.g., hard stands, tie-downs), federal inspection fees, and security reimbursements paid by the airline whether to the airport or another agency. Typically excludes special airline facilities self-financed by an airline (e.g., terminal facilities to be operated by the airline). Excludes ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars); airline self-funded construction (e.g., build-out of terminal space); other costs incurred by the airline to operate at the airport (e.g., fuel, maintenance, personnel, services, supplies and equipment) except where the airport provides these services directly (e.g., deicing services at some airports). Does not include delay costs.

Data Sources

Airport records, or FAA Form 127

Applicability

All commercial service airports

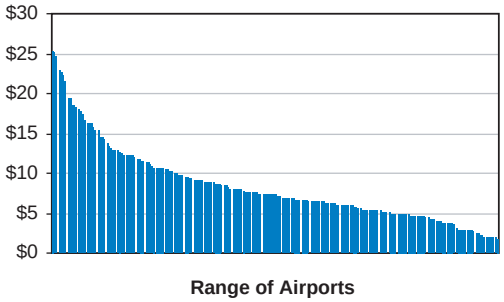
Comments

Becomes a difficult measurement where airlines self-invest in terminal facilities - including entire terminals or partial (e.g., certain concourses) and differing levels of airline investment in fit-up and equipment. Such practices remove significant parts of the terminal from the rate base. Can attempt to add back the nominal cost of such excluded rental fees to approach a meaningful API for the airport. Airport CPEs are often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's CPE when initially completed. CPE is highly sensitive to changes in the level of enplanements.

Very important for self-benchmarking, including the trend over time. Because difficult to obtain true "apples-to-apples" measure, less reliable for peer benchmarking, but this API is one of the most widely used comparative measure among airports.

Example

Estimated CPEs for Airports over 100,000 Enplanements



Source: FAA Form 127 and Oliver Wyman analysis

Copyright National Academy of Sciences. All rights reserved.

FN C-10
Financial

Airport Cost per Enplanement

Definition

Airport total costs per enplanement, i.e., operating cost plus non-operating cost divided by enplanements.

Data Sources

Airport records or FAA Form 127.

Applicability

All commercial service airports. Cargo airports will use a different divisor, such as Operations. General aviation airports may track change in total airport costs over prior period.

Comments

Provides a measure of total airport costs on a unit basis, which must be paid from aeronautical and non-aeronautical sources. Important for self-benchmarking and peer benchmarking. Reasonably straightforward for peer benchmarking because use of Total Costs avoids definition and allocation differences between airports that arise when considering Operating and Non-Operating Costs, Direct and Indirect Costs, etc.

Copyright National Academy of Sciences. All rights reserved.

98 Resource Guide to Airport Performance Indicators

FN C-11
Financial

Bond Rating

Definition

Rating of airport debt as assigned by major rating agencies: Fitch, Moody's, Standard & Poors.

Data Sources

Airports pay a fee to the rating agencies to have their debt rated. Various data sources track the ratings of airport bonds, and individual rating changes are typically the subject of a press release by the rating agency.

Applicability

All airports that issue rated debt, which includes virtually all medium and large airports. Small and General Aviation Airports are affected by the ratings of their municipalities.

Comments

Each rating agency uses its own scale to assess the financial strength of the issuer. For example, Standard & Poors' highest rating is AAA, which means "Extremely strong capacity to meet financial commitments". Moody's highest rating is Aaa, which means that the obligation is "judged to be of the highest quality, with minimal credit risk." S&P's highest B rating is BBB, which means "Adequate capacity to meet financial commitments, but more subject to adverse economic conditions." Moody's highest B rating is Baa, which means that the debt is "subject to moderate credit risk. They are considered medium grade and as such may possess certain speculative characteristics."

The criteria used by rating agencies include service area characteristics and air traffic demand, financial strength and diversity of carriers, use and lease provisions, and airport finances.

Important for self-benchmarking and peer benchmarking.

Example

Sample of Airport Bond Ratings by Moody's

Alabama	Birmingham Airport	A2
	Huntsville Airport	A2
Alaska	Alaska International Airports System	
	Senior Lien	Aa3
	AIEDA Rental Car Facility Charge	A3
Arizona	Phoenix Sky Harbor International Airport	
	Airport Revenue-Senior Lien	Aa3
	Car Rental Facility Charge Revenue	A3
	Tucson Airport Authority	
	Airport Revenue-Senior Lien	A1
	Airport Revenue-Subordinate Lien	A2

Source: Moody's Global Infrastructure Finance, U.S. Airport Medians for FY 2008 (November 2009)

Copyright National Academy of Sciences. All rights reserved.

FN C-12
Financial

Days Unrestricted Cash on Hand

Definition

Unrestricted cash and investments, divided by average daily operating and maintenance expenditures (equal to annual operating and maintenance expenditures divided by 365).

Data Sources

Airport records

Applicability

All airports

Comments

Definition is equivalent to Moody's "Days cash on hand". A measure of available cash (excluding restricted accounts such as debt service reserves) to cover operating expenses and other financial requirements on short notice.

Important for self-benchmarking, to let the airport know how this liquidity measure is trending. Moderately useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN C-13
Financial

Debt per Enplanement

Definition

Total airport debt per enplanement, measured at the end of the reporting period.

Data Sources

Airport records or FAA Form 127.

Applicability

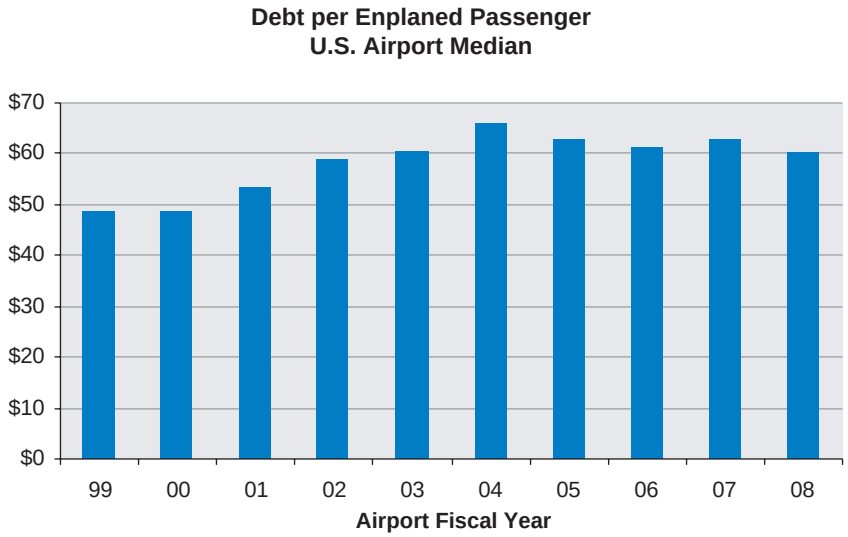
All commercial service airports. GA and cargo airports will use different divisor -- operations or based aircraft. Useful in comparing trend over time and in benchmarking with other airports.

Comments

An important measure of an airport's fixed costs and one the rating agencies weigh heavily when assigning debt ratings. Beyond speaking to debt load, serves as an important measure of resiliency during periods of economic downturn. Moody's Global Infrastructure Finance publishes U.S. Airport Medians for a variety of financial measures, including Long Term Debt, Debt per Enplaned Passenger, Debt per O&D Enplaned Passenger, etc. Where an airport is in its CIP cycle (and paying for same) will influence this indicator.

Useful for self-benchmarking and peer benchmarking. Any differences in definition need to be understood and taken into account before normalizing data. However with rating agency scrutiny of this API, there is probably a good level of data commonality already built in.

Example



Source: Moody's Global Infrastructure Finance, U.S. airport Medians for FY 2008 (November 2009)

Copyright National Academy of Sciences. All rights reserved.

FN C-14
Financial

Debt Service Coverage Ratio

Definition

Net revenues as defined in an airport's bond ordinance divided by principal and interest requirements for the fiscal year.

Data Sources

Airport records

Applicability

All airports with outstanding revenue bonds

Comments

Definition is same as Moody's "Debt service coverage per bond ordinance". The Debt Service Coverage Ratio measures an airport's ability to service its debt, and shows the cash flow cushion available to meet debt serve obligations. May also be measured on a GAAP basis, as opposed to per bond ordnance.

The airport's type of coverage -- whether a funding requirement (and if so, one-time or annual funding) or a revenue sufficiency test -- affects its financial reserves and the level of rates and charges needed to generate the funding. Should also differentiate between required minimum coverage and actual coverage at a given time.

As defined above, the Debt Service Coverage Ratio is an important factor in the bond rating process and is useful for self-benchmarking. It is not useful for peer benchmarking because of differences in the definition of net revenues.

In the broader corporate finance context, the Debt Service Coverage Ratio is typically defined as net operating income (earnings before interest and taxes) divided by total debt service. Using that definition, peer benchmarking may be conducted using Form 127 data. Care should be taken to compare airports with similar types of coverage.

Example



Source: Moody's Global Infrastructure Finance, U.S. airport Medians for FY 2008 (November 2009)

Copyright National Academy of Sciences. All rights reserved.

102 Resource Guide to Airport Performance Indicators

FN C-15
Financial

Non-Aeronautical Operating Revenue as % of Total Operating Revenue

Definition

Total non-aeronautical operating revenue as a percentage of total operating revenue.

Data Sources

Airport records or FAA Form 127

Applicability

All airports

Comments

Measures success in diversifying revenue source away from aeronautical charges. Typically includes revenues from concessions, parking, rental cars, land and other business development. Excludes aeronautical operating revenues and non-operating revenues (such as PFCs and interest income).

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN C-16
Financial

Non-Aeronautical Operating Revenue per Enplanement

Definition

Total non-aeronautical operating revenue per enplaned passenger.

Data Sources

Airport records or FAA Form 127

Applicability

All commercial service airports

Comments

On an enplanement basis, measures success in diversifying revenue sources away from charges to aeronautical users. Typically includes revenue from concessions, parking, rental cars, land and other business development. Excludes aeronautical operating revenues and non-operating revenues such as PFCs and interest income.

Important for self-benchmarking and peer benchmarking. This benchmark relates two values with a more direct causal relationship than does Net Operating Income per Enplanement, for enplanements (which drive passenger spending) play a larger role in producing non-aeronautical revenues than they do in producing airport revenues generally.

Copyright National Academy of Sciences. All rights reserved.

104 Resource Guide to Airport Performance Indicators

FN C-17
Financial

Operating Cost per Enplanement

Definition

Total operating costs per enplanement. Excludes depreciation.

Data Sources

Airport records or FAA Form 127.

Applicability

All commercial service airports. Cargo airports will use a different divisor, typically cargo tons. General aviation airports will track change in operating cost over the prior period.

Comments

Useful measurement because it focuses on airport costs and excludes non-operating expenses (primarily debt service and depreciation). Includes administrative costs and allocated overhead costs.

The ACI-NA Benchmarking Survey excludes depreciation in calculation of operating cost; however FAA Form 127 includes depreciation. Form 127 also specifies eight other expense categories: (1) personnel compensation and benefits, (2) communications and utilities, (3) repairs and maintenance, (4) marketing, advertising, and promotion, (5) supplies and materials, (6) contractual services, (7) insurance, claims, and settlements, (8) other.

Useful for self-benchmarking and peer benchmarking. Differences in definition need to be understood and taken into account before normalizing data.

Copyright National Academy of Sciences. All rights reserved.

FN K-1
Financial

Accounts Receivable Aging – Days

Definition

A periodic report measuring balances of receivables, broken down by customer and month.

Data Sources

Airport records

Applicability

All airports

Comments

Accounts receivable aging is used to identify problem customers. In recent years, largely as a result of airline bankruptcies, airports have become more vigilant about monitoring accounts receivable, and have also required larger tenant deposits than in the past. Airports typically increase their collection efforts as the average of their accounts receivable lengthens, and they may also tighten credit policies. Apart from using the accounts receivable aging schedule, airports often measure the average number of days until receivables are collected.

This API may be used for self-benchmarking and for peer benchmarking.

Example

Accounts Receivable Aging Schedule
31-Dec-09

Supplier's Name	*Total Accts. Payable*	*Current*	*30-Jan Days Past Due*	*31-60 Days Past Due*	*Over 60 Days Past Due*
Airline A	$20,000	$20,000	----	----	----
Cargo Tenant B	$3,000	$2,500	$500	----	----
Vendor C	$1,000	$500	$300	$200	----
Airline D	$10,000	$2,500	$2,500	$2,500	$2,500
Total	$34,000	$25,500	$3,300	$2,700	$2,500

Source: Oliver Wyman

Copyright National Academy of Sciences. All rights reserved.

FN K-2
Financial

Airline Cost per Operation

Definition

Average of what airlines pay in airport fees per operation at the airport.

Data Sources

Airport records or FAA Form 127.

Applicability

All commercial service airports, and also may be applied to cargo and general aviation airports.

Comments

Has many of the same issues as Airline Cost per Enplanement, FN C-10. See that API for comments also applicable to this API. In lieu of enplanement levels, over which airports have little control, this indicator substitutes operations, over which airports also have little control. Becomes a difficult measurement where airline self-investment in terminal facilities – including both entire terminals and differing levels of airline investment in fit-up and equipment – removes significant parts of the terminal from the rate base. Can attempt to add back the nominal cost of such excluded rental fees to approach a meaningful API for the airport. The Airline Cost per Operation (CPO), like the Airline Cost per Enplanement, is often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's CPO when initially completed. CPO is highly sensitive to changes in the level of operations, which may vary with changing equipment types as well as anticipated demand patterns.

May be used both to self-benchmark operating costs and for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN K-3
Financial

Airport Revenue from Non-Passenger-Dependent Sources (%)

Definition

Measures percentage of airport revenue from non-passenger dependent sources, such as investment income, corporate jets, oil & gas wells, industrial development, golf courses and other compatible uses of airport-owned land.

Data Sources

Airport records

Applicability

Commercial service airports

Comments

As airports strive to diversify revenue sources, they find that their primary non-aeronautical sources of revenue, such as concession income and parking income, are nevertheless strongly correlated with and dependent on passenger trends. This measure attempts to track airport revenue from sources that are not dependent on airline passengers. As industry standardization of its definition and data collection are refined, this API is likely to become more important over time. Useful for self-benchmarking and for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN K-4
Financial

Contract Services Cost as % of Total Operating Cost

Definition

Total outside contract services cost as % of total operating cost. Because airports outsource different functions, it may be more useful in some cases to track contract service costs of particular functions, such as police and fire.

Data Sources

Airport records or FAA Form 127

Applicability

All airports

Comments

FAA Form 127 lists contract services as including “consulting, legal, accounting, auditing, security, firefighting, engineering, training, lobbying, maintenance, janitorial services, architectural fees, and financial services.” This indicator is used primarily to measure the degree of outsourcing at an airport. It also reflects the price paid for that outsourcing and the airport’s mix of contract services and other operating costs. For these reasons, this API is best viewed at a high level. It may be used either to self-benchmark outsourcing trends at an individual airport or to roughly peer-benchmark the degree of outsourcing among similar airports.

Copyright National Academy of Sciences. All rights reserved.

FN K-5
Financial

Debt Service as % of Operating Revenue

Definition

Debt service (principal plus interest) as a percent of operating revenue.

Data Sources

Airport records or FAA Form 127.

Applicability

All airports that issue debt, which includes virtually all medium and large airports.

Comments

Higher debt service as a percent of operating revenue is generally found at airports that are undertaking or have recently completed major capital development programs. At higher percentages, the airport is likely to have less flexibility in spending. This measure is not among those specifically listed and tracked in Moody's U.S. Airport Medians, but it is tracked by a number of states and municipalities. The State of Massachusetts, for example, includes it as a primary indicator of "debt affordability."

Useful for self-benchmarking over time, and for peer benchmarking to provide one comparison of debt service burden.

Copyright National Academy of Sciences. All rights reserved.

110 Resource Guide to Airport Performance Indicators

FN K-6
Financial

Investment Income as % of Invested Assets

Definition

Investment income as % of invested assets.

Data Sources

Airport records

Applicability

All airports

Comments

Designed to measure return on airport investments in financial instruments. May include capital gains, dividends, and interest. Useful to compare individual airport performance with investment returns on various short-term financial instruments which are readily available. A measure of how well the airport invests cash on a short-term basis. Not used for self-benchmarking over time as short-term interest rates fluctuate widely. Also because of differing investment horizons and requirements, of limited use for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN K-7
Financial

Long-Term Debt per Enplanement

Definition

Long-term debt per enplanement measured at the end of the reporting period.

Data Sources

Airport records or FAA Form 127.

Applicability

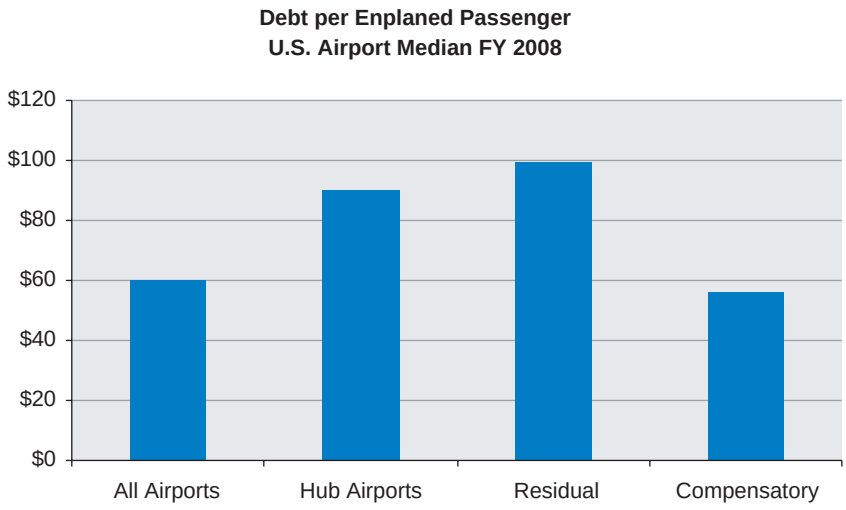
All airports with outstanding long-term debt.

Comments

An important measure of an airport's debt burden. Moody's tracks total debt per enplaned passenger instead, which is long-term debt plus short-term debt, divided by enplaned passengers.

Useful both for self-benchmarking debt burden and for peer benchmarking. Moody's publishes (total) debt per enplaned passenger medians for different airport categories, as shown below.

Example



Source: Moody's Global Infrastructure Finance, U.S. airport Medians for FY 2008 (November 2009)

Copyright National Academy of Sciences. All rights reserved.

112 Resource Guide to Airport Performance Indicators

FN K-8
Financial

Net Operating Income per Enplanement

Definition

Airport operating revenue (aeronautical plus non-aeronautical) minus airport operating expenses (excluding depreciation) expressed on a per-enplanement basis.

Data Sources

Airport records or FAA Form 127.

Applicability

All commercial service airports. GA and cargo airports will use different divisor.

Comments

Also referred to as Operating Revenue per Enplanement. Measures airport's revenue generation in excess of operating costs.

Useful for both self-benchmarking and peer benchmarking. For peer benchmarking, however, airport ratemaking methodology will influence the result, so it is important to select the peer group carefully.

Copyright National Academy of Sciences. All rights reserved.

FN K-9
Financial

Net Working Capital (Operating Liquidity)

Definition

Net working capital, also known as working capital, represents operating liquidity available to the airport. It is calculated as current assets minus current liabilities.

Data Sources

Airport records

Applicability

All airports

Comments

Positive working capital means that an airport has sufficient funds to satisfy maturing short-term debt and upcoming operational expenses. The management of working capital involves managing inventories, accounts receivable, accounts payable, and cash. Working capital is important to an airport as an absolute measure of its operating liquidity. Working capital may also be self-benchmarked and used for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

114 Resource Guide to Airport Performance Indicators

FN K-10
Financial

Operating Cost per Operation

Definition

Airport total operating cost per operation

Data Sources

Airport records or FAA Form 127

Applicability

All airports

Comments

An important measure of an airport's operating cost efficiency, although subject to fluctuations in the number of operations that are beyond the airport's control. Useful for providing another perspective on airport operating costs in addition to examining operating costs per enplanement. Also, unlike "per enplanement" measures, this indicator may be used for cargo airports.

Useful for both self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

FN K-11
Financial

Personnel Cost per Enplanement

Definition

Personnel cost (total of salary, wages, and benefits costs) per enplanement.

Data Sources

Airport records or FAA Form 127.

Applicability

All commercial service airports. GA and cargo airports will use different divisor.

Comments

Examining personnel costs per enplanement in comparison with other airports may provide airports with useful information in examining staffing and compensation. Because airports outsource to differing degrees, however, it is important to benchmark comparable workforces in terms of the functions performed by employees. A more comprehensive measure of personnel cost would add back in the cost of contractors performing functions in place of airport employees. Useful for self-benchmarking, less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Financial – Other APIs

No.	Indicator Name	Definition
FN O-1	Airline Cost per Acre	Airline fees paid divided by total airport acres
FN O-2	Airline Cost per Terminal Sq. Ft.	Airline s/f. rental rate – average and by type of space
FN O-3	Airline Costs per Gate	Average airline gate rental payments to the airport, per gate
FN O-4	Airline Operations	Airline landings plus takeoffs at the airport
FN O-5	Airline Payments as Percentage of Airport Operating Revenues	Airline fee payments to the airport as a percentage of total airport operating revenues
FN O-6	Airline Rental Cost per Gate	Defined either as annual cost of incremental gate or as average cost of gate rental and associated support/ terminal space
FN O-7	Airline Terminal Area in Rate Base	Terminal area utilized by airlines and included in terminal rental rate formula
FN O-8	Airline Terminal Rental Revenues	Payments by airlines to airport for use of terminal facilities
FN O-9	Airport Central Staff Employees	Number of airport central staff employees
FN O-10	Airport Direct Operating Cost per 1000 Lbs Landed Weight	Average airport direct operating cost per 1000 lbs landed weight
FN O-11	Airport Direct Operating Cost per Enplanement	Average airport direct operating cost per enplaned passenger
FN O-12	Airport Direct Operating Costs	Airport direct operating costs. Does not include allocated costs.
FN O-13	Airport Indirect Operating (Administrative Overhead) Costs	Airport indirect operating cost (administrative overhead) costs. Uses allocated costs.
FN O-14	Airport Indirect Operating Cost as Percentage of Total Operating Cost	Indirect operating cost (administrative overheads) as percentage of total operating cost
FN O-15	Airport Indirect Operating Cost per 1000 Lbs Landed Weight	Airport indirect operating cost (administrative overhead) per 1000 lbs landed weight
FN O-16	Airport Indirect Operating Cost per Enplanement	Airport indirect operating cost (administrative overhead) per enplanement
FN O-17	Airport Non-Operating Costs	Airport non-operating costs. Measures costs not related to the airport's core operations such as cost of borrowing.
FN O-18	Airport Operating Cost per Enplanement	Total operations and maintenance cost per enplanement
FN O-19	Airport Operating Costs	Total airport operating costs
FN O-20	Airport Operating Revenue	Revenue derived from airport operations
FN O-21	Airport Operations Cost per 1000 Lbs Landed Weight	Total operations and maintenance cost per 1000 lbs landed weight
FN O-22	Annual Capital Cost as Percentage of Total Cost	Capital cost as percentage of total cost on annual basis
FN O-23	Annual Subsidy from Primary Airport to Relievers	Annual subsidy from primary airport to reliever airports
FN O-24	Asset Value per Employee	Airport asset value per employee
FN O-25	Average Annual Hangar Space Rental Cost	Average annual hangar space rental cost per sf
FN O-26	Average Annual Tie-Down Space Rental Cost	Average annual tie-down space rental cost
FN O-27	Average Cycle Time of Key Financial Activities	How often on average airport key financial activities are repeated — e.g., bank reconciliations, parking audits,
FN O-28	Average Interest Rate Paid on Long-Term Debt	Average interest rate paid on long-term debt obligations

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
FN O-29	Average Interest Rate Paid on PFC-Backed Debt	Average interest rate paid on PFC-backed debt
FN O-30	Average Interest Rate Paid on Total Debt	Average interest rate paid on total debt
FN O-31	Average PFC per Enplaned Passenger	Average PFC per enplaned passenger, taking into account the two PFC-limit per one-way trip
FN O-32	Average PFC Refunds per Reporting Period	Average PFC refunds per reporting period
FN O-33	Building Maintenance Cost – Total	Total cost of building maintenance – all airport buildings
FN O-34	Capital Expenditure per Enplanement	Capital expenditure per enplanement during the fiscal year
FN O-35	Cash Flow / Cap-X	Cash flow / Capital Expenditures in a given period
FN O-36	Concession Revenue Offsetting Airline Fees	Amount of concession revenue serving to offset/reduce airline fees under terms of airline-airport agreement
FN O-37	Cost of Equipment Failure	Measures the cost of outage of specific types of equipment
FN O-38	Cost to Budget Ratios	Actual cost of particular projects or line items, divided by the amount budgeted
FN O-39	Crown Rents Paid	Crown rent paid by Canadian airports to the Canadian Government
FN O-40	Current PFC Collection Level/Totals to Potential PFC Revenue	Comparison of PFC revenues currently collected to PFC revenues if the airport collected the maximum allowable amount
FN O-41	Debt – Other than Long-Term	Airport debt other than long-term
FN O-42	Debt / Equity Percentage	Percentage of debt to equity
FN O-43	Debt per O&D Enplaned Passenger	Debt per O&D enplaned passenger
FN O-44	Debt per Operation	Debt per operation
FN O-45	Debt Ratio	Net funded debt divided by the sum of net fixed assets and net working capital
FN O-46	Debt Service Payments Net of PFCs per Enplanement	Debt service payments net of PFCs per enplanement during the period
FN O-47	Debt Service Safety Margin	Net revenues less principal and interest requirements for year divided by gross revenues
FN O-48	Depreciation Cost per Enplanement	Depreciation cost per Enplanement
FN O-49	Direct Operating Cost per Airport Employee	Direct operating cost per airport employee
FN O-50	Dollar Amount of Fees & Expenses Paid to Outside Counsel	Dollar amount of fees & expenses paid to outside counsel
FN O-51	Earnings (Net Revenues)	Gross revenues minus expenses
FN O-52	EBIT Margin	Earnings before interest and taxes divided by net revenue
FN O-53	EBITDA	Earnings before interest, taxes, depreciation, and amortization
FN O-54	Elements of Capital Funding as % of Total Capital Funding	Percentage of total capital funding represented by each funding element (bonds, grants, etc.)
FN O-55	Enplanements per Airport Employee	Enplaned passengers per airport employee
FN O-56	Errors in Accounting Reports	Errors in accounting reports
FN O-57	Frequency of Internal Performance Auditing of Departments and Activities	Frequency of internal performance auditing of departments and activities
FN O-58	Interest Payments on Debt Other than Long-Term	Interest paid by airport on debt other than long term
FN O-59	Interest Payments on Long-Term Debt per 1000 Lbs Landed Weight	Interest paid on long-term debt obligations, per 1000 lbs landed weight
FN O-60	Interest Payments on Long-Term Debt	Interest paid by airport on its long-term debt
FN O-61	Interest Payments on Long-Term Debt per Cargo Ton	Interest paid on long-term debt obligations, per cargo ton enplaned

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
FN O-62	Interest Payments on Long-Term Debt per Enplanement	Interest paid on long-term debt obligations, per enplaned passenger
FN O-63	Interest Payments on PFC-backed Debt	Interest payments on PFC-backed debt
FN O-64	Inventory Shrinkage (%)	Percentage of Inventory Shrinkage
FN O-65	Investment Income	Investment income on airport funds and other investible holdings
FN O-66	Labor Utilization Rates	A measure of productivity using the amount of time on a specific project or task
FN O-67	Landed Weight (000 Lbs)	The total amounts of weight of aircraft landings or take-offs at the airport for domestic, international and cargo carriers (in millions of pounds) depending on the basis for charging landing fees (i.e., by take-off or landing). Does not include landed weights for GA and Military aircraft.
FN O-68	Landing Fee Revenues	Revenues from fees charged to aircraft owners and operators for the use of runways, taxiways, landing strips, runway protection zones, and clearways. Does not include fees for parking aircraft.
FN O-69	Levels of Airport Funds Over Time	Funds levels in airport funds over time
FN O-70	Long Term Debt as % of Total Assets	Long-term debt as % of total assets
FN O-71	Long Term Goals Achieved (%)	Long-term goals achieved as a percentage of the total number of long-term goals
FN O-72	Long-Term Debt	Total long-term debt, including the current portion of long-term debt
FN O-73	Long-Term Debt per 1000 Lbs Landed Weight	Amount of airport long-term debt per 1000 lbs landed weight
FN O-74	Material & Supply Costs per Enplaned Passenger	Material & supply costs per enplaned passenger
FN O-75	Net Fixed Assets	Fixed assets and construction-in-progress less accumulated depreciation
FN O-76	Net Operating Revenue	Excess (or deficit) of airport operating revenues over operating costs
FN O-77	Net Operating Revenue After Debt Service	Excess (or deficit) of operating revenues over operating costs less debt service
FN O-78	Non-Aeronautical Revenue from Reliever Airports	Non-aeronautical revenue from relievers
FN O-79	Non-Aeronautical Revenue Generated Through New (Not Replacement) Businesses	Non-aeronautical revenue generated through new (not replacement) businesses
FN O-80	Non-Airfield Acreage Developed	Non-airfield area of airport already developed
FN O-81	Non-Operating Cost per Enplanement	Airport non-operating cost per enplaned passenger
FN O-82	O&D Passengers	Passengers originating at the airport plus passengers terminating at the airport
FN O-83	Operating Cost per Enplanement (with Depreciation)	Total airport operating cost, including depreciation, per enplanement
FN O-84	Operating Margin	Ratio of operating revenue to operating costs
FN O-85	Operating Revenue per Employee	Operating revenue per employee
FN O-86	Operations per Airport Employee	Total operations per airport employee
FN O-87	Other Operating Expenses per Enplaned Passenger	Other operating expenses per enplaned passenger
FN O-88	Outside Contract Services Cost as Percentage of Direct Operating Cost	Cost of outside contract services compared to airport total direct operating cost
FN O-89	Personnel Lost Time Costs	Measures the cost of absenteeism, training and other circumstances that take employees away from their assigned functions

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
FN O-90	PFC-Backed Debt per Enplanement	PFC-backed debt per enplaned passenger
FN O-91	Preventative Maintenance Costs Compared to Total Maintenance Costs	A measure of the effectiveness of the preventative maintenance program
FN O-92	Private Investment at the Airport	Private investment at the airport measured in dollars
FN O-93	Profit Margin	The difference between total cost and total revenue
FN O-94	Projected to Actual PFC Collections	Projected PFC revenue compared to Actual PFC collections
FN O-95	Ratio of Productive Labor Hours to Actual Labor Hours	A measure of staff productivity
FN O-96	Relative Levels of Airport Cost Elements per Enplanement	Displays the relationship of airport cost elements on a per enplanement basis – e.g., direct costs, indirect costs, operating costs, non-operating costs
FN O-97	Relative Levels of Airport Revenue Elements per Enplanement	Displays the relationship of airport revenue elements on a per enplanement basis – e.g., airline fees revenues, concession revenues
FN O-98	Return on Cash Balances	Investment return on cash balances
FN O-99	Return on Equity	Return on Equity
FN O-100	Revenue to Expenditure Ratio	Total revenue compared to total costs after depreciation and interest
FN O-101	Routine Reports – Percent on Time	Percentage of routine reports completed and submitted within deadline
FN O-102	Routine Reports per Accountant	A measure of accounting staff productivity
FN O-103	Salaries, Wages & Benefits as Percentage of Direct Operating Cost	Salaries, wages and benefits total cost as a percentage of direct operating costs
FN O-104	Salaries, Wages & Benefits Cost – Total	Salaries, wages and benefits total cost, for personnel directly employed by the airport
FN O-105	Salaries, Wages & Benefits Cost per Enplanement	Salaries, wages and benefits cost per enplanement
FN O-106	Senior Debt Service Coverage	Senior debt service coverage
FN O-107	Short-Term Debt per Enplanement	Short-term debt per enplanement measured at the end of the reporting period
FN O-108	Telecommunications Costs per Enplanement	Airport telecommunications costs per enplaned passenger
FN O-109	Terminal Square Footage per Airport Employee	Total square footage of terminal space per airport employee
FN O-110	Tool Shrinkage (%)	Percentage of Tool Shrinkage
FN O-111	Total Airport Cost per 1000 Lbs Landed Weight	Airport total cost per 1000 lbs landed weight
FN O-112	Total Airport Costs	Total airport costs
FN O-113	Total Airport Debt	Total airport debt
FN O-114	Total Airport Expenses per Acre	Total airport expenses per acre
FN O-115	Total Airport Interest Payments	Total interest payments by the airport on all airport debt
FN O-116	Total Airport Operating Cost per Airport Employee	Total airport operating cost per airport employee
FN O-117	Total Airport Revenue	Total revenue received by the airport
FN O-118	Total Dollar Value of PFC Refunds	Total dollar value of PFC refunds
FN O-119	Total Dollar Value of PFCs Collected	Total dollar value of PFCs collected
FN O-120	Total Landside Revenue per Enplanement	Total landside revenue per enplanement
FN O-121	Total Maintenance Cost per Square Foot of Buildings and Paved Areas	A measure of the cost of upkeep for specific facilities
FN O-122	Total Outside Contract Services Cost	Total outside contract services cost
FN O-123	Total PFC-Backed Debt	Total PFC-backed debt
FN O-124	Total Professional Services Costs	Total professional services costs

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
FN O-125	Unrestricted Financial Assets (Including Cash)	Total value of unrestricted financial assets, including cash
FN O-126	Value Added per Employee	SVA (shareholder value analysis) or EVA (economic value added) used to calculate this measure
FN O-127	Work-Load Units (WLU)	One WLU is comprised of one passenger or 100 kg of freight or mail

Copyright National Academy of Sciences. All rights reserved.

Fuel (FL)

Fuel performance measures are used primarily to track fuel sales and profits.

Core Indicators

Fuel Use/Sales – Change over Prior Period..... GA C-19

Key Indicators

Fuel Sales Net Profit/Loss or Fuel Flowage Fees ..... FL K-1

See Other Indicators in .....***Airfield Operations, Environmental, Fuel, General Aviation, Safety/Risk Management***

Comments

- Fuel sales are of primary importance at small commercial airports and GA airports. See fuel-related APIs in Section 6.10, General Aviation.
- Larger commercial service airports frequently do not track fuel sales, as the airlines buy fuel directly and arrange for its distribution through fuel consortia.

Copyright National Academy of Sciences. All rights reserved.

FL K-1
Fuel

Fuel Sales Net Profit/Loss or Fuel Flowage Fees

Definition

Airport's net profit or loss from the sale of aviation fuel plus gallonage fees for fuel sold and dispensed on airport property. Also includes the fees the airport charges to aircraft owners, operators, and fuel providers, such as the fuel flowage fees charged to FBOs for fueling aircraft on airport property.

Data Sources

Airport records and FAA Form 127

Applicability

All airports

Comments

Definition provided tracks Form 127 definition and ACI-NA survey definition. Profit from fuel sales is a critical revenue source for GA airports.

Related APIs

Fuel Use/Sales – Change over Prior Period.....GA C-19

Copyright National Academy of Sciences. All rights reserved.

Fuel – Other APIs

No.	Indicator Name	Definition
FL O-1	Average Cost per Gallon Paid by General Aviation for Jet Fuel	Average cost per gallon paid by general aviation for jet fuel
FL O-2	Average Cost per Gallon Paid for Aviation Gasoline	Average cost per gallon paid for aviation gasoline
FL O-3	Gallons of Fuel Sold per Flight – Commuters/Regional	Gallons of fuel sold per flight
FL O-4	Gallons of Fuel Sold per Flight – Domestic	Gallons of fuel sold per flight
FL O-5	Gallons of Fuel Sold per Flight – Freighters (Cargo)	Gallons of fuel sold per flight
FL O-6	Gallons of Fuel Sold per Flight – International	Gallons of fuel sold per flight
FL O-7	Gallons per Refueling Unit (Trucks, Filters, Meters, Fuel Pits)	Gallon throughput for each refueling type (trucks, filters, meters, fuel pits) or each unit
FL O-8	Labor Cost per Refueling Unit	Labor cost per refueling type or unit for airport-provided fueling services including via contractor
FL O-9	Labor Costs – Fueling Operations	Labor costs of fueling operations – for airport-provided fueling services including via contractor
FL O-10	Longevity of Consumables in Various Categories vs Expected Lives	Longevity of consumables in various categories vs expected service lives: light bulbs (runway, taxiway, other), mechanical, etc.
FL O-11	Material Costs – Airport Fueling Operations	Material costs – fueling operations for airport-provided fueling services including via contractor
FL O-12	Materials Cost per Refueling Unit	Materials cost per refueling unit for airport-provided fueling services including via contractor
FL O-13	Mechanic Man-Hours – Fueling Operations	Mechanic man-hours – fueling operations, for airport-provided fueling services including via contractor
FL O-14	Refueler Man-Hours per Shift	Refueler man-hours per shift for airport-provided fueling services including via contractor
FL O-15	Refueler Staffing Man-Hours	Refueler staffing man hours for airport-provided fueling services including via contractor
FL O-16	Repair Cost per Refueling Unit	Repair cost per refueling unit for airport-provided fueling services including via contractor
FL O-17	Repair Costs – Fueling Operations	Repair costs – fueling operations for airport-provided fueling services including via contractor

Copyright National Academy of Sciences. All rights reserved.

General Aviation (GA)

General aviation airport performance measures focus on revenue generated by fuel sales and hangar rent and ground leases instead of the wider range of income generated by commercial service airports. In place of passenger measures, general aviation airports focus on operations and based aircraft.

Core Indicators

Based Aircraft ..... GA C-18
Fuel Use/Sales – Change over Prior Period..... GA C-19
Hangar Rental and Ground Lease Income..... GA C-20

Key Indicators

Activity at Nearby Towered Airport – General Aviation ..... GA K-1

Related Core and Key Indicators

Concessions

FBO Revenue to the Airport – Change over Prior Period..... CN K-4

All Core and Key Categories except Air Service and Cargo

See Other Indicators in ..... ***all areas except Air Service and Cargo***

Comments

- The majority of general aviation airports are non-towered which makes it difficult to collect accurate data regarding the number of operations. See discussion in Core API Aircraft Operations.
- Even at towered GA airports, the use of operations as a denominator in various APIs is problematic because of the different types of operations connected. For example, touch-and-go operations conducted as part of flight training do not directly drive costs or revenues the same way that commercial operations do.

Copyright National Academy of Sciences. All rights reserved.

126 Resource Guide to Airport Performance Indicators

GA C-18
General Aviation

Based Aircraft

Definition

Number of aircraft based at a particular airport.

Data Sources

Airport records. Also, based aircraft information is reported in the NPIAS.

Applicability

Primarily general aviation

Comments

Helpful to track by aircraft type – piston, turboprop, jet, since utilization, fuel usage, and facilities requirements differ. Currently, based aircraft information is reported by individual airport managers to the FAA and State airport inspectors during the course of annual Form 5010-1 inspections. While specific numbers are provided by the managers, there is little guidance on how the numbers should be derived, nor any list linking specific aircraft to the numbers provided by the managers. The FAA's National Based Aircraft Inventory Program is attempting to develop more accurate counts of based aircraft.

Based aircraft counts are one criterion used to determine eligibility for inclusion in FAA's National Plan of Integrated Airport Systems (NPIAS). An airport must be included in the NPIAS in order to receive Federal funds. In addition, the number of based aircraft drives operational demands on airport facilities like runways, lighting and navaids, as well as ground facilities such as hangar storage, fueling facilities, and aircraft service and repair facilities.

Very important for self-benchmarking and peer benchmarking.

Example



Source: FAA website

Copyright National Academy of Sciences. All rights reserved.

GA C-19
General Aviation

Fuel Use/Sales – Change over Prior Period

Definition

Total gallons (liters) of fuel supplied to airlines or other aeronautical users by airport FBO's or third-party contractors – typically divided into Jet A and AvGas.

Data Sources

Airport or FBO records

Applicability

General aviation airports, small/nonhubs, and commercial service airports with significant general aviation activity.

Comments

Significant revenue source and metric, particularly for general aviation and small/nonhubs. Measures the change in the amount of fuel sold. May show that GA pilots are purchasing fuel elsewhere than the airport. May also reflect trends in amount of flying and changing mix of aircraft using local airport. Very important for self-benchmarking and useful for peer benchmarking where data is available.

Note: cross-referenced APIs in Section 6.9, Fuel.

Copyright National Academy of Sciences. All rights reserved.

128 Resource Guide to Airport Performance Indicators

GA C-20
General Aviation

Hangar Rental and Ground Lease Income

Definition

Annual revenue to the general aviation airport from hangar rentals and ground leases, considered separately and in total.

Data Sources

Airport records. (FAA Form 127 captures cargo and hangar rentals and ground leases.)

Applicability

General aviation airports and other airports with hangar rental and ground lease income.

Comments

For general aviation airports, hangar rentals are typically the second-largest source of revenue after fuel sales. At some airports, the airport may lease land to individual lessees who construct their own hangars, while at other airports, the airport owns the hangar. Therefore, care must be taken in the comparison.

Useful for self-benchmarking, less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

GA K-1
General Aviation

Activity at Nearby Towered Airport – General Aviation

Definition

Number of operations at nearby towered airport.

Data Sources

Airport records

Applicability

General aviation airports

Comments

Primarily used by non-towered airports to enable them to gauge relative activity at nearby towered airports which collect consistent and accurate activity data. For non-towered airports, individual operators self-report the number of operations, which is a much less consistent and accurate data source. FAA Air Traffic Activity Data System (ATADS) contains official air traffic operations data. On the 20th of each month, data for the previous month is made available. Useful for tracking operations at nearby airports.

By definition a peer benchmarking exercise. Important.

Copyright National Academy of Sciences. All rights reserved.

General Aviation – Other APIs

No.	Indicator Name	Definition
GA O-1	Based Aircraft per FTE	Based aircraft per FTE
GA O-2	Hours Flown	Aggregate number of hours flown by aircraft based at airport
GA O-3	Pilot Counts	Number of based pilots operating from an airport

Copyright National Academy of Sciences. All rights reserved.

Grants (GR)

Performance measures for Grants are used to track passenger volume and trends. General aviation airport performance measures focus on revenue generated by fuel sales and hangar rent and ground leases instead of the wider range of income generated by commercial service airports. In place of passenger measures, general aviation airports focus on operations and based aircraft.

Key Indicators

FAA Discretionary Grant Funding Awarded Annually..... GR K-1
FAA Total Grant Funding Awarded Annually..... GR K-2
Grant Funding Other than FAA Awarded Annually..... GR K-3

See Other Indicators in ..... ***Financial***

Comments

- FAA entitlement grants are awarded by formula, and are a more important component of airport revenue for smaller airports than larger airport which lose a majority of their entitlement funding as a condition to their imposition of PFCs.
- Some state grants may also be awarded by formula.
- FAA discretionary grants are project specific, and airports track and compare their success in obtaining these grants.

Copyright National Academy of Sciences. All rights reserved.

132 Resource Guide to Airport Performance Indicators

GR K-1
Grants

FAA Discretionary Grant Funding Awarded Annually

Definition

Total discretionary FAA grant funding awarded to the airport annually. Includes cargo discretionary funding considered separately and totaled with passenger discretionary funding.

Data Sources

Airport and FAA records

Applicability

All airports

Comments

Discretionary grants are usually project-specific.

Useful for self-benchmarking, not as useful for peer benchmarking, although airports often compare the amount of discretionary grant funding they receive for major projects of a similar type, such as new runways.

Copyright National Academy of Sciences. All rights reserved.

GR K-2
Grants

FAA Total Grant Funding Awarded Annually

Definition

Total FAA grant funding awarded to the airport annually, comprised of entitlement grants and discretionary grants.

Data Sources

Airport and FAA records

Applicability

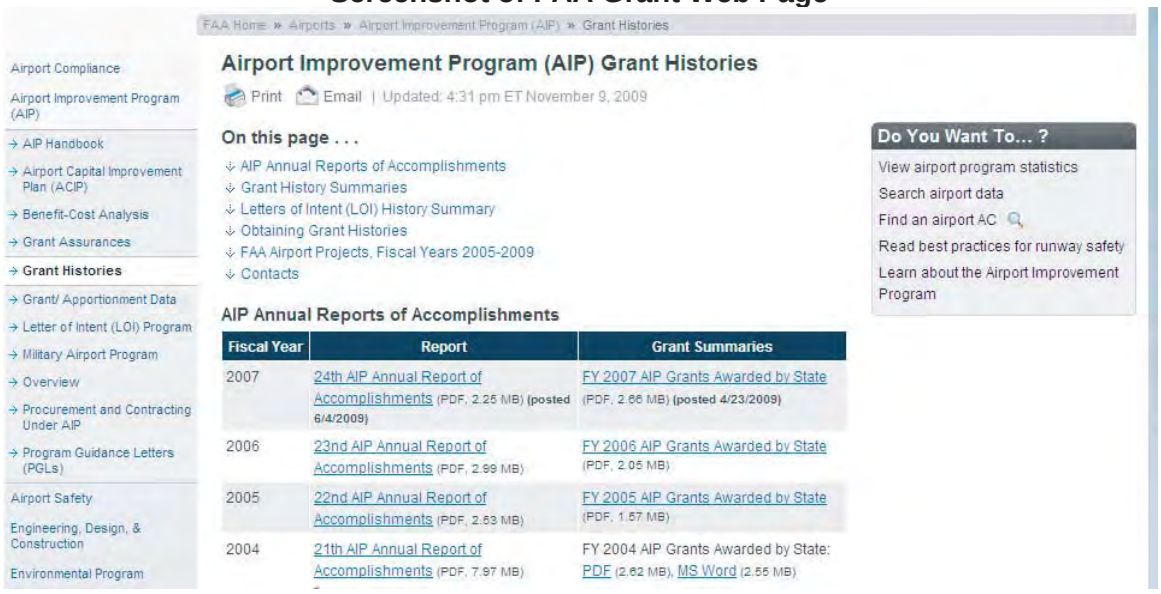
All airports

Comments

Most airports self-benchmark grant funding. Discretionary grants are usually project-specific. This API is of limited use in peer benchmarking, although airports often compare the amount of discretionary grant funding they receive for major projects of a similar type, such as new runways.

Example

Screenshot of FAA Grant Web Page



Source: FAA website

Copyright National Academy of Sciences. All rights reserved.

134 Resource Guide to Airport Performance Indicators

GR K-3
Grants

Grant Funding Other than FAA Awarded Annually

Definition

Grant funding awarded to the airport annually from sources other than the FAA.

Data Sources

Airport records

Applicability

All airports

Comments

Non-FAA grants are generally provided by state Departments of Transportation or state Aviation Funds, but may come from other sources, including federal non-FAA sources. Airports focus on grant funding from multiple sources as part of their efforts to fund needed safety, planning, and development projects and to minimize charges.

Ten states participate in the FAA's State Block Grant Program under which the states assume responsibility for administering FAA Airport Improvement Program (AIP) grants at airports classified as "other than primary" airports — that is, nonprimary commercial service, reliever, and general aviation airports. Each state is responsible for determining which locations will receive funds for ongoing project administration. FAA grants made under the State Block Grant Program are not included in this API.

Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Grants – Other APIs

No.	Indicator Name	Definition
GR O-1	FAA Cargo Discretionary Funding per Cargo Ton	FAA Cargo funds obtained by airport per cargo ton enplaned (same year)
GR O-2	FAA Discretionary Funding per Enplanement	FAA discretionary funds obtained by airport per enplaned passenger (same year)
GR O-3	FAA Entitlement Funding	FAA entitlement grants received by airport
GR O-4	Speed of Grant Application Processes and Receipt of Funds	Speed of grant application processes and receipt of funds
GR O-5	Total Grant Funding per Passenger	A measure of airport management's effectiveness in procuring non-entitlement grants

Copyright National Academy of Sciences. All rights reserved.

Human Resources (HR)

Human Resources performance measures are used primarily to track employee costs, productivity, diversity, job satisfaction, and training

Core Indicators

M/W/DBE Participation Rate; Actual vs. Cost ..... HR C-21
Salary + Wages + Benefits Cost as % of Total Operating Cost ..... HR C-22
Salary + Wages + Benefits Cost per Airport Employee ..... HR C-23

Key Indicators

Airport Employees (FTEs) – Change over Prior Period ..... HR K-1
Airport Projects Meeting M/W/DBE Requirements without Waivers (%) ..... HR K-2
Annual Employee Turnover ..... HR K-3
Benefits as % of Total Compensation ..... HR K-4
Employee Evaluations – Timeliness ..... HR K-5
Employee Job Satisfaction ..... HR K-6
Enplanements per Airport Employee ..... HR K-7
Overtime Cost as Percent of Total Wages ..... HR K-8
Training Hours per Employee ..... HR K-9
Workforce Diversity ..... HR K-10

Other Related Core and Key Indicators

Financial

Personnel Cost per Enplanement ..... FN K-11

Police/Security

Sworn Police Officer Average Salary (5+ Years Experience) ..... PS K-6

See Other Indicators in ..... ***ARFF, Financial, Police/Security***

Comments

- Because airports outsource to differing degrees, it is important to compare similar workforces.
- Some airports attempt to measure outsourced personnel along with in-house staff.

Copyright National Academy of Sciences. All rights reserved.

HR C-21
Human Resources

M/W/DBE Participation Rate; Actual vs. Goal

Definition

Dollar amount of work performed by M/W/DBE firms in relation to goals set.

Data Sources

Airport records

Applicability

All airports

Comments

Airports may establish different goals for different categories, including: (1) professional services, (2) construction, and (3) concessions.

The Airport Minority Advisory Council is a national, nonprofit trade association dedicated to promoting the full participation of minority-owned, women-owned and disadvantaged business enterprises in airport contracts and employment opportunities. AMAC reports on contracts awarded to M/W/DBE firms, publishes a directory of firms, and conducts an annual conference.

Degree of importance of this measure varies from community to community. Useful for both self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR C-22
Human Resources

Salary + Wages + Benefits Cost as % of Total Operating Cost

Definition

Total salary, wages and benefits cost as a percentage of total airport operating cost.

Data Sources

Airport records or FAA Form 127

Applicability

All airports

Comments

To determine the actual cost to the airport for its personnel function, should add back in the cost of contractors performing functions in place of airport employees and include contract personnel numbers using an FTE concept.

Also, when used for benchmarking, important to adjust for outsourcing as airports differ widely in the types of functions outsourced and the degree of outsourcing. Useful for self-benchmarking, less so for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR C-23
Human Resources

Salary + Wages + Benefits Cost per Airport Employee

Definition

Average of salary, wages, and benefits cost per airport employee.

Data Sources

Airport records or FAA Form 127

Applicability

All airports

Comments

Airports outsource to differing degrees. Therefore, it is important to benchmark comparable workforces in terms of the functions performed by employees. To determine the actual cost to the airport for its personnel function, should add back in the cost of contractors performing functions in place of airport employees and include contract personnel numbers using an FTE concept.

Useful for self-benchmarking, less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-1
Human Resources

Airport Employees (FTEs) – Change over Prior Period

Definition

Number of airport employees, expressed as full time equivalents (FTEs).

Data Sources

Airport records or ACI-NA Benchmarking Survey

Applicability

All airports

Comments

Includes full-time, part-time and temporary personnel who are legally employees of the airport, measuring same on an FTE basis. As such, does not capture contract personnel providing services. Therefore, must be used with care, both for self- and peer benchmarking.

Some airports include in the count personnel provided under service contracts, which enables them to estimate the total of personnel providing services to the airport.

When used for comparative purposes, a number of different divisors may be used, enplanements being the most common.

Important for self-benchmarking and for peer benchmarking with airports that have similar functions outsourced.

Copyright National Academy of Sciences. All rights reserved.

HR K-2
Human Resources

Airport Projects Meeting M/W/DBE Requirements without Waivers (%)

Definition

The percent of airport projects that meet M/W/DBE requirements without waivers.

Data Sources

Airport records

Applicability

All airports

Comments

Measure of airport compliance with established M/W/DBE Sources. Useful for self-benchmarking. Because different airports set different goals, not well suited for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-3
Human Resources

Annual Employee Turnover

Definition

The number of employee departures divided by the average number of employees over the course of the year. May be tracked separately for total employees and for probationary employees.

Data Sources

Airport records

Applicability

All airports

Comments

Measure of workforce stability and employee satisfaction. The average number of employees is the number at the beginning of the year plus the number at the end, divided by two. Total employee departures are counted, although organizations may track voluntary and involuntary departures separately. Rates of turnover vary over time and reflect factors specific to individual organizations as well as the availability of alternative employment (which is related to regional and national economic health).

Useful for self-benchmarking and peer benchmarking airport performance with other businesses and local government, as well as other airports.

It may be useful to consult the labor turnover survey published by the Bureau of Labor Statistics.

Copyright National Academy of Sciences. All rights reserved.

144 Resource Guide to Airport Performance Indicators

HR K-4
Human Resources

Benefits as % of Total Compensation

Definition

Benefits costs, including health insurance, life insurance, pensions, and other benefits, as a percentage of total compensation. Total compensation = salaries + wages + benefits.

Data Sources

Airport records or industry surveys

Applicability

All airports

Comments

Benefit packages vary considerably, and some airports with lower average wages may have higher benefits. Therefore, the two categories should be looked at together. Also, good benefits are usually important in attracting and motivating employees and therefore may be a useful tradeoff for higher wages.

Useful for self-benchmarking, less so for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-5
Human Resources

Employee Evaluations – Timeliness

Definition

Percent of employee evaluations completed within the prescribed time.

Data Sources

Airport records

Applicability

All airports

Comments

Some airports report that requiring employee evaluations to be completed on time improves the usefulness of the evaluation process and overall organizational performance. Establishing an API to track the timely completion of employee evaluations reinforces the importance of the evaluation process. Formal evaluations, while important and in some cases mandated, are not a substitute for timely comment (supportive or critical) to an employee while a job-performance event (good or bad) is still fresh.

Important for self-benchmarking, less so for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-6
Human Resources

Employee Job Satisfaction

Definition

The average level of employee satisfaction based on survey information.

Data Sources

Airport records

Applicability

All airports

Comments

Many vendors specialize in developing employee surveys, including employee satisfaction surveys. Surveys are increasingly taken online, although some surveys may still rely on paper questionnaires, and some use personal interviews by outside firms. Employee satisfaction is important for many reasons, one of the most important being the correlation between employee satisfaction and customer satisfaction.

Employee engagement is a closely-related indicator. Employee engagement is generally defined to mean the level of involvement and enthusiasm that employees feel about their jobs and their organizations. Similar survey techniques are used to measure employee engagement.

Because of a lack of standardization among surveys, employee job satisfaction and employee engagement are best suited for self-benchmarking. Comparison data with other organizations, including but not limited to airports, can be provided by vendors to derive some measure of how the airport compares with other organizations.

Copyright National Academy of Sciences. All rights reserved.

HR K-7
Human Resources

Enplanements per Airport Employee

Definition

The number of enplanements per airport employee, expressed as FTEs.

Data Sources

Airport records

Applicability

Commercial service airports

Comments

A measure of airport staffing in relationship to activity. An incomplete measure for multiple reasons, including: (1) airports outsource to varying degrees (this measure does not capture employees provided through outsourcing), and (2) employee activity or productivity is not necessarily captured by enplanements – EWLUs, operations, or other measures may more accurately reflect workload.

Despite these limitations, this API may be useful for a rough self-benchmarking exercise, track a key output (enplanements) with a key input (employees). The trend may be the most important aspect of this API. If the airport's enplanements are declining but its employee count remains high or is even increasing, this may indicate changes are needed. This API can also be used for peer benchmarking, provided care is taken in selection of comparably situated peer airports.

Copyright National Academy of Sciences. All rights reserved.

HR K-8
Human Resources

Overtime Cost as Percent of Total Wages

Definition

Overtime cost as percent of total wages.

Data Sources

Airport records

Applicability

All airports

Comments

Measure of staffing utilization and costs. Changing percentage of overtime may signal need for changes in staffing levels, scheduling practices, or approach to work, including examining ways to “de-peak” work requirements and/or find more efficient ways to accomplish work tasks.

Useful for self benchmarking; less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-9
Human Resources

Training Hours per Employee

Definition

The number of hours employees spend each year in training, typically calculated for particular employee groups, such as police, fire, etc., for comparability.

Data Sources

Airport records

Applicability

All airports

Comments

Measure of airport investment in employee training. As noted, typically tracked separately for different departments, e.g., police, fire, and security. There are numerous training requirements for different airport employee groups and functions. These include ARFF training, hazmat training, disaster and emergency preparedness, and many other areas. As just one example, the FAA has training requirements for airport personnel involved in controlling wildlife hazards at airports. See AC 150-5200-36.

Useful for self-benchmarking and for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

HR K-10
Human Resources

Workforce Diversity

Definition

Percent of women and minorities in the airport workforce and airport management.

Data Sources

Airport records

Applicability

All airports

Comments

Airports may track diversity within their workforce as a whole and within their management group, with the goal of a diverse workforce representative of the community.

Useful for self-benchmarking. Use for peer benchmarking only with care to select similarly-situated airports.

Copyright National Academy of Sciences. All rights reserved.

Human Resources – Other APIs

No.	Indicator Name	Definition
HR O-1	Absenteeism Rates	Average absenteeism by department
HR O-2	Airport Collective Bargaining Negotiations Completed within Deadlines	Airport collective bargaining negotiations completed within deadlines
HR O-3	Airport Employees – Number of	Number of airport employees
HR O-4	Average Open Positions Filled in Pay Range (by Quadrant)	Measure of airport's effectiveness in executing its staffing plan, also its competitiveness of its pay scale compared with other employers in its region
HR O-5	Average Salary Increase	Average salary increase in a given period
HR O-6	Benefit Cost per Employee	A measure of non-salary benefits provided to employees
HR O-7	Certifications Held by Specific Departments – Number of	Measures the level of "professionalism" of a department or the airport as a whole
HR O-8	Comparable Pay in Critical Categories	A measure of the airport's competitiveness in the salary and benefits arena
HR O-9	Days Open Positions Remain Vacant After Being Posted – Number of	Number of days open positions remain vacant after being posted. Measures airport's effectiveness in executing its staffing plan, also its competitiveness versus other employers in its region.
HR O-10	DBE Contractor Fees as Percentage of Total Contractor Fees	DBE contractor fees as percentage of total contractor fees
HR O-11	DBE Contractors Working at Airport on Annual Basis – Number of	Number of DBE contractors working at airport on annual basis
HR O-12	DBE/MBE Contracts as a Percentage of Total Contracts	DBE/MBE contracts as a percentage of total contracts
HR O-13	DBE/MBE Participation Rate on Specific Projects	The number of DBE/MBE firms participating on a project compared to the total number of firms
HR O-14	Disabled Employees	Number of disabled employees
HR O-15	Employee Attitude Change Scores	Change in employee satisfaction, measured through periodic surveys and during performance evaluations
HR O-16	Employee Opinion on Management Policies	Employee opinion on management policies, measured through periodic surveys and during performance evaluations
HR O-17	Error Rates in Processing Benefit Claims	Error rates in processing benefit claims
HR O-18	Full Time Equivalent (FTE) Employees – Number of	Total number of full time equivalent employees
HR O-19	Governing Body Employees Dedicated to Airport – Number of	Number of governing body employees dedicated to airport
HR O-20	Grievance Settlements Costs	Grievance Settlements Costs
HR O-21	Labor Grievances – Number of	Number of Labor Grievances
HR O-22	Minority Employees at Upper Management Levels (%)	Percentage minority employees at upper management levels to total upper management
HR O-23	Minority Employees to Total Employees (%)	Percentage minority employees to total employees
HR O-24	New Certifications Acquired – Number of	A measure of the training program's success or effectiveness
HR O-25	Overtime Cost as a Percentage of Total Wages	Overtime paid as a percentage of total wages
HR O-26	Performance Reviews Over Time for Total Work Force – Number of	Number of performance reviews over time for total work force

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
HR O-27	Pre- & Post-Test Scores from Training Programs	A measure of improvement or effectiveness of training programs
HR O-28	Ratio of Airport Central Staff to Total Staff Employees	Percentage of airport central staff employees to total staff employees
HR O-29	Salaries, Wages & Benefits Costs per 1000 Lbs Takeoff Weight	Salaries, wages & benefits costs per 1000 Lbs takeoff weight
HR O-30	Training / Course Student-Hours	Number of course student-hours delivered per month
HR O-31	Training / Course Volume – Various Specific Departments/Functions	Number of courses delivered per month in a range of department specialties and functions, e.g., IT
HR O-32	Training / Customer Satisfaction	Percentage of positive course evaluation forms completed by students
HR O-33	Training / Updates and New Course Development	Number of new and refresher courses offered per year
HR O-34	Training Cost per Airport Employee	Training cost per airport employee, in dollars
HR O-35	Training Hours per Employee – Number of	A measure of the number of hours of training provided on a per-employee basis
HR O-36	Turnover Rate of Probationary Employees	Turnover rate of probationary employees
HR O-37	Vacancies Compared with Total Jobs – Number of	Vacancies compared with Total Jobs
HR O-38	Women Employees at Upper Management Levels to Total Upper Management (%)	Percentage women employees at upper management levels to total upper management
HR O-39	Women Employees to Total Employees (%)	Percentage women employees to total employees

Copyright National Academy of Sciences. All rights reserved.

Information Technology (IT)

Information Technology performance measures are used primarily to track IT system reliability

Key Indicators

Mean Time to Repair .....IT K-1
Network-in-Service Time (%).....IT K-2

See Other Indicators in ..... ***Financial***

Comments

- Other industries use a variety of IT reliability measures, although there are few agreed-upon core indicators apart from the two listed above.
- Cost effectiveness and customer satisfaction are also important measures for IT.

Copyright National Academy of Sciences. All rights reserved.

IT K-1
Information Technology

Mean Time to Repair

Definition

Mean time to repair system outage.

Data Sources

Airport records

Applicability

All airports

Comments

This IT service quality API is important because it measures how quickly the airport is able to recover from a system outage. It indicates how effective are the processes and controls the IT organization has put in place to support the IT system. Many organizations are able to repair small outages quickly. However, for major outages, there is a large difference in the Mean Time to Repair between high performing and low performing organizations.

If the airport has different repair service providers -- contractors, the airport's own IT staff -- they each should be evaluated on this API.

May be useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

IT K-2
Information Technology

Network-in-Service Time (%)

Definition

Percent of time airport IT network is available and functioning.

Data Sources

Airport records

Applicability

All airports

Comments

This IT service quality measure is important because of the need to have the airport's IT network available and functioning at all times. May be useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Information Technology – Other APIs

No.	Indicator Name	Definition
IT O-1	Bulk IT Hardware Procurement (%)	Percent of IT hardware purchases included in recurring "bulk procurement" program
IT O-2	IT Customer Satisfaction	Percentage of positive survey responses received from weekly samples of a percentage (e.g., 10%) of service calls closed during previous week
IT O-3	IT Network Security – Number of Attacks	Percentage of intrusions detected within 15 minutes of attack
IT O-4	IT Network Security – Containment	Percentage of attacks resolved within one hour of detection
IT O-5	IT Network Security – ISS Reviews	Completion of procedures and configuration settings to ensure conformance with management directives and policies
IT O-6	IT Network Security – PCI Compliance and Reporting	PCI DSS certification is successfully maintained
IT O-7	IT Network Security – Vulnerability Identification	The amount of time needed to identify and contain a high security vulnerability
IT O-8	IT System Maintenance Rework (%)	Percent of remedial problems that have been reported as corrected, but that re-occur within 30 days
IT O-9	IT System Security – Denial of Service	Percentage of denial of service attacks detected and deflected with no impact to IT network
IT O-10	IT System Security – Intrusion Prevention (%)	Intrusion prevention and detection
IT O-11	IT Systems – Airport Website Content Posting	Time required to post routine updates on the airport website
IT O-12	IT Systems – Data Back Up Completion (%)	Backups of data and critical systems are successfully completed as scheduled
IT O-13	IT Systems – Data Restoration (%)	Percentage of times all data is restored and systems functioning properly within 24 hours of restoration decision
IT O-14	IT Systems – Equipment Malfunctions Advance Warning (%)	Percentage of time advance warning of impending equipment malfunctions and other service disruptions is provided to affected groups
IT O-15	IT Systems – Hardware Compatibility Assurance (%)	Percentage of time new hardware does not cause crashes or other adverse effects
IT O-16	IT Systems – Software Compatibility Assurance (%)	Percentage of time new software and applications do not cause crashes when provided to users
IT O-17	IT Systems – Software Quality Assurance (%)	Percentage of time new software works properly with no major data integrity issues for 60 days after installation
IT O-18	IT Systems – Website Links Malfunctioning (%)	Percent of broken links from web pages or links not functioning
IT O-19	IT Systems – Workstation Customer Information (%)	When problem cannot be resolved on first visit, percentage of time technician properly and completely explains next steps
IT O-20	IT Systems – Workstation Repair (%)	Percentage of time workstation problems fixed within 24 hours of problem report, permitting users to resume normal functioning
IT O-21	IT Systems – Workstation Service Time	Average time to close workstation repair tickets

Copyright National Academy of Sciences. All rights reserved.

Legal (LG)

Legal performance measures are primarily used to measure the timeliness of completion of routine assignments, and the level of outside counsel costs.

Key Indicators

Contract Reviews Completed on Time (%) .....LG K-1
Outside Counsel Fees & Expenses.....LG K-2

See Other Indicators in ..... ***Financial, Properties/Contracts***

Comments

- There are very few good Legal performance indicators. Most revolve around: (1) assignments completed in a timely manner, where the difficulty is dealing with a wide variety of assignments having indeterminate due dates, and (2) budget and cost issues, where the difficulty is also dealing with a wide variety of assignments.

Copyright National Academy of Sciences. All rights reserved.

158 Resource Guide to Airport Performance Indicators

LG K-1
Legal

Contract Reviews Completed on Time (%)

Definition

Percentage of contracts reviewed by legal department within specified review period.

Data Sources

Airport records

Applicability

All airports

Comments

Measures timeliness of legal review of airport contracts. Important because projects and programs of nearly all airport departments depend on timely contract review.

This API can be selectively extended to other matters handled by the airport's Legal Department, though the variability of legal assignments makes it difficult to establish timeliness APIs across the board.

Useful for self-benchmarking. Less useful for peer benchmarking, although airports may find it useful to compare average legal review periods for airport contracts.

Copyright National Academy of Sciences. All rights reserved.

LG K-2
Legal

Outside Counsel Fees & Expenses

Definition

Amount spent annually on outside counsel fees & expenses.

Data Sources

Airport records

Applicability

All airports

Comments

Measures outside counsel costs for airports, regardless of how financed — whether expensed or capitalized in a financings including bond issues. Intended to track true outside counsel costs, as opposed to budget allocation for legal services provided by separate municipal or county department. Capitalized counsel fees may be tracked separately.

Outside counsel costs should be tracked to determine trends regarding issues that require legal assistance, as well as cost effectiveness of legal services. For example, litigation is routinely referred to outside counsel. The size and expertise of in-house law department personnel will determine extent to which other matters are referred to outside counsel versus handled internally. Legal services are a specialized subset of the contracting-out phenomenon and require similar decision-making on whether and when to add in-house personnel.

Useful for self-benchmarking; less useful for peer benchmarking, although airports may be interested in general comparisons with other airports.

Copyright National Academy of Sciences. All rights reserved.

Legal – Other APIs

No.	Indicator Name	Definition
LG O-1	Assignments Completed in a Given Year – Number of	Number of assignments completed in a given year
LG O-2	Assignments Completed in a Given Year (%)	Percentage of new and pending assignments completed in a given year
LG O-3	Assignments Opened in a Given Year – Number of	Number of assignments opened in a given year
LG O-4	Assignments to Legal Department Completed on Time (%)	Number of assignments to legal department completed on time vs total number of assignments
LG O-5	Legal Dept Budget % Represented by Fees & Expenses Paid to Outside Counsel	Percentage of legal dept budget represented by fees & expenses paid to outside counsel
LG O-6	Matters Referred for Handling by Outside Counsel – Number of	Number of matters referred for handling by outside counsel
LG O-7	Matters Referred for Handling by Outside Counsel (%)	Percentage of matters referred for handling by outside counsel
LG O-8	Salary & Benefits & Expenses Cost of In-House Legal Staff vs Fees & Expenses Paid to Outside Counsel	Salary & benefits & expenses cost of in-house legal staff vs fees & expenses paid to outside counsel
LG O-9	Successful Outcomes in Litigation (%)	Cases successfully litigated vs total cases litigated

Copyright National Academy of Sciences. All rights reserved.

Maintenance (MN)

Maintenance performance measures are primarily used to measure the cost of maintaining areas of the airport, buildings, systems, and equipment, as well as the reliability of particular systems and equipment.

Key Indicators

Airport Vehicles – Average Age ..... MN K-1
Custodial/Janitorial Cost per Square Foot of Terminal ..... MN K-2
Escalators, Moving Walkways, and Elevators – Percent of Time in Service ..... MN K-3
Jet Bridge Maintenance Cost ..... MN K-4
Maintenance Cost per Square Foot of Terminal ..... MN K-5
Runway/Taxiway Maintenance Cost ..... MN K-6

Related Core and Key Indicators

Energy Management

Airfield Electricity Consumption – Change over Prior Period ..... EN K-1

See Other Indicators in ..... ***Airfield Operations, Energy Management, Financial, Terminal Operations***

Comments

- Numerous specialized maintenance indicators are used, depending on the situation. See sampling in Other Maintenance Indicators.

Copyright National Academy of Sciences. All rights reserved.

MN K-1
Maintenance

Airport Vehicles – Average Age

Definition

Average age of airport vehicles, typically by type of vehicle.

Data Sources

Airport records

Applicability

All airports

Comments

Airports own and manage a variety of vehicles, large fleets at larger airports. This API is directed toward vehicle replacement requirements. Some airports rely instead (or in addition) on regular condition assessments of individual vehicles. They may also approach vehicle condition assessment by tracking miles or hours of use, or percentage of time operational.

Useful for self-benchmarking and for peer benchmarking. Important to compare similar vehicle types, as different types of vehicles have different useful lives. Due to hard use some police vehicles typically have lower useful lives than other similar vehicles. Specialized vehicles (e.g., snow removal equipment) will have useful lives particular to their type.

Copyright National Academy of Sciences. All rights reserved.

MN K-2
Maintenance

Custodial/Janitorial Cost per Square Foot of Terminal

Definition

Custodial/janitorial cost per square foot of terminal buildings maintained by the airport.

Data Sources

Airport records

Applicability

All airports

Comments

Measures custodial/janitorial cost per square foot. Useful for self-benchmarking. Also useful for peer benchmarking provided care is taken that square footage comparisons are apples-to-apples, which is often not the case. Reported airport square footage is typically based on gross or rentable sq. ft., as opposed to actual sq. ft. in which janitorial services are provided.

Can also usefully track the gross total amount spent on terminal custodial/janitorial services over time.

Copyright National Academy of Sciences. All rights reserved.

MN K-3
Maintenance

Escalators, Moving Walkways, and Elevators – Percent of Time in Service

Definition

Percent of time that escalators, moving walkways, and elevators are in service.

Data Sources

Airport records

Applicability

All airports

Comments

Escalators, moving sidewalks and elevators are highly visible and heavily-used facilities. High out-of-service time reflects poorly on the airport maintenance and its customer care program. Should measure each type of facility separately. Useful for self-benchmarking and for peer benchmarking.

Also can measure the cost of maintaining escalators, moving sidewalks and elevators – each type of facility separately, total cost and per unit.

Copyright National Academy of Sciences. All rights reserved.

MN K-4
Maintenance

Jet Bridge Maintenance Cost

Definition

Total annual cost of maintaining jet bridges divided by the number of jet bridges in use.

Data Sources

Airport records

Applicability

All airports with jet bridges

Comments

Many airports own and maintain jet bridges. Some bridges were transferred from the airlines, others were purchased new. It is useful for airports to track and compare the cost of jet bridge maintenance as an indicator of the maintenance cost burden of these facilities. Each individual jet bridge should also be tracked separately as an aid in the repair/replace decision.

This API may be used for self-benchmarking, and may also be used for peer benchmarking airports with similar weather and gate utilization profiles.

Copyright National Academy of Sciences. All rights reserved.

MN K-5
Maintenance

Maintenance Cost per Square Foot of Terminal

Definition

Maintenance cost per square foot of terminal maintained by airport.

Data Sources

Airport records

Applicability

All airports

Comments

Measures terminal building maintenance costs including preventive and remedial maintenance. Maintenance work is typically done using both internal and external resources. In addition, maintenance costs may be divided between standard and exceptional costs. For example, a roof repair would be considered a standard maintenance cost, whereas a roof replacement could be considered an exceptional maintenance cost.

Different types of terminal space have different maintenance requirements. Heavily-trafficked public areas such as holdrooms will need more intensive maintenance and upkeep than (e.g.) back office areas. In addition to tracking maintenance cost on a square foot basis, the maintenance cost of major terminal building systems should be tracked separately – including HVAC, electrical, plumbing, energy management, security, mechanical, water treatment, elevators, roofing, and flooring.

This API may be used for self-benchmarking and for peer benchmarking airports with similar facilities profiles. Maintenance costs are dependent on building age, so maintenance costs for a new terminal shouldn't be compared with those of an old one.

Can also measure terminal maintenance costs against the number of passengers using the particular facility.

Copyright National Academy of Sciences. All rights reserved.

MN K-6
Maintenance

Runway/Taxiway Maintenance Cost

Definition

Total annual cost of maintaining runways and taxiways.

Data Sources

Airport records

Applicability

All airports

Comments

An important part of the cost of operating an airport. FAA Form 127 includes the cost of repairs and maintenance for the entire airport, but does not break down the results for airfield versus terminal. May be important to differentiate between concrete and asphalt runways. This will assist in choice-of-materials decisions during construction of new runways and taxiways and at the time of major repair/renovation.

This API may be used for self-benchmarking and may also be used for peer benchmarking airports with similar airfield configurations and similar weather conditions.

Copyright National Academy of Sciences. All rights reserved.

Maintenance – Other APIs

No.	Indicator Name	Definition
MN O-1	Airfield Non-Runway Maintenance Cost	Total cost of maintaining portions of the airfield area other than runways
MN O-2	Building Maintenance Cost per Enplanement	Total airport building maintenance cost per enplaned passenger
MN O-3	Cost of Elevator/Escalator/Moving Sidewalk Maintenance	Total cost of maintaining elevators, escalators and moving sidewalks
MN O-4	Cost of Maintaining Roadways – Non-Airfield	Cost of maintaining roadways outside the airfield
MN O-5	Cost of Maintenance – Fleet Types	Average cost of maintenance by vehicle fleet types
MN O-6	Cost of Maintenance – Specific Vehicles	Cost of maintenance on specific vehicles. An input to the "repair or replace" decision
MN O-7	Custodial/Janitorial Cost – Total	Total airport cost of custodial/janitorial service
MN O-8	Elevators/Escalators/Moving Sidewalks – Number of	Total number of elevators, escalators and moving sidewalks on the airport
MN O-9	Fleet Usage by Type of Vehicle	Number of miles driven by vehicle fleet type
MN O-10	Gas Mileage – Vehicles and Ground Equipment Fleet – Airport	Gas mileage for each vehicle and type of vehicle – airport fleet
MN O-11	Gas Mileage – Vehicles and Ground Equipment Fleet – Tenants	Gas mileage for each vehicle and type of vehicle – tenant fleet
MN O-12	Ground Power In-Service Percentage	Percentage of time ground power available
MN O-13	Groundskeeping Maintenance Cost per Acre	Groundskeeping maintenance cost per acre
MN O-14	HVAC Cost per Enplanement	Cost of operating HVAC systems per enplaned passenger
MN O-15	HVAC Cost per Terminal Building Area with HVAC Service (s.f.)	Cost of operating terminal HVAC systems per terminal building area with HVAC service
MN O-16	Jet Bridge In-Service Percentage	Percentage of time jet bridges are available for use
MN O-17	Maintenance Inspections per Year	Number of maintenance inspections per year
MN O-18	Maintenance Work Orders per Vehicle	Typically divided into different vehicle categories
MN O-19	Mechanical Systems – Duration of System Failure	A measure of system reliability and response time
MN O-20	Passenger Sensitive Equipment In-Service Percentage	Percentage of time that passenger-sensitive equipment (e.g., elevators, escalators, moving sidewalks) is operable and in service
MN O-21	Pre-Conditioned Air In-Service Percentage	Percentage of time pre-conditioned air is available
MN O-22	Preventive Maintenance Hours Spent	Hours spent on preventive maintenance
MN O-23	Runway Maintenance Cost	Total cost of maintaining runways and taxiways
MN O-24	Tenant Vehicles – Average Years in Service	Average years in service of tenant vehicles by fleet type
MN O-25	Terminal Area With HVAC Service	Area of terminal building with HVAC service
MN O-26	Terminal Building Custodial/Janitorial Cost	Cost of custodial/janitorial service – terminal building(s)
MN O-27	Terminal Building Maintenance Cost	Cost of maintenance – terminal building(s)
MN O-28	Terminal Elevator/Escalator/Moving Sidewalk Maintenance Cost per Unit	Maintenance cost of terminal elevators/escalators/ moving sidewalks per terminal unit
MN O-29	Terminal Elevator/Escalator/Moving Sidewalk Operating Cost per Unit	Operating cost of terminal elevators/escalators/moving sidewalks per unit
MN O-30	Terminal HVAC Cost	Cost of HVAC service in terminal building

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
MN O-31	Total Airport Building Maintenance Cost per Area Maintained (S.F.)	Total airport building maintenance cost per area maintained (s.f.)
MN O-32	Total Airport Custodial/Janitorial Cost per Enplanement	Total airport custodial/janitorial cost per enplaned passenger
MN O-33	Total Building Area with HVAC Service	Total airport building area with HVAC service
MN O-34	Total HVAC Cost	Total airport HVAC cost
MN O-35	Vehicle Maintenance Cost	Total cost of maintaining vehicles operated by the airport
MN O-36	Vehicle Maintenance Cost per Enplanement	Vehicle maintenance cost per enplaned passenger
MN O-37	Vehicle Maintenance Cost per Vehicle	Vehicle maintenance cost per vehicle. Also can be measured according to vehicle types.
MN O-38	Vehicles – Number of	Number of vehicles operated by the airport
MN O-39	Wildlife/Bird Strikes – Ground Vehicles	Wildlife/bird strikes – ground vehicles
MN O-40	Work Orders Completed within Guidelines (%)	Percentage of work orders completed within guidelines

Copyright National Academy of Sciences. All rights reserved.

Parking (PK)

Parking performance measures are used primarily to measure revenue produced, parking utilization, and on-airport parking capture rates.

Core Indicators

Parking Revenue to the Airport per Originating Passenger ..... PK C-24

Key Indicators

Parking Revenue per Transaction ..... PK K-1
Parking Spaces ..... PK K-2
Parking Transactions per Month by Parking Product ..... PK K-3
Parking Utilization – Peak Period ..... PK K-4
Privately-Operated Off-Airport Parking Spaces as Percent of Total Parking Spaces ..... PK K-5
Revenue per Day per Parking Space ..... PK K-6
Vehicles Parked per Originating Passenger ..... PK K-7

Related Core and Key Indicators

Financial

Non-Aeronautical Operating Revenue as % of Total Operating Revenue ..... FN C-15
Non-Aeronautical Operating Revenue per Enplanement ..... FN C-16

See Other Indicators in ..... ***Concessions, Financial, Service Quality***

Comments

- At commercial service airports, parking revenue often ranks 2nd only to airline revenue as the largest airport revenue source.
- Airports track parking revenue closely. Because of differences in ground transportation patterns and the availability of off-airport parking, benchmarking parking is more difficult.

Copyright National Academy of Sciences. All rights reserved.

PK C-24
Parking

Parking Revenue to the Airport per Originating Passenger

Definition

Revenues (income) to the airport from on-airport parking operations and services (e.g., valet fees). Reported revenues should be the airport's net after its costs. Includes revenues from public parking only.

Data Sources

Airport records. FAA Form 127 groups revenue from off-airport parking operators and ground transportation revenues (taxis, limos, shuttles) with parking revenues. ACI-NA Benchmarking reports these categories separately.

Applicability

All commercial service airports. General aviation airports may track total parking revenue.

Comments

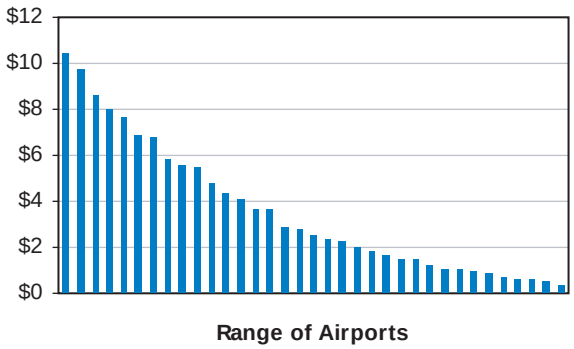
Usually the largest source of non-aeronautical revenue. Urban airports in major cities may produce lower revenue, depending on the availability of public transportation. Also, increased cell phone usage and cell phone lots have impacted short-term parking as those offering rides may no longer need to park. Airports have been able to increase parking revenue by adjusting rates, changing the mix of parking types offered (daily, hourly, long-term parking, etc.), and offering additional services (valet parking, cleaning, etc). Revenue to the airport is a function of gross revenue and contractual arrangement with the concessionaire or, in the case of airport-managed parking operations, the airport's own costs of managing parking.

At airports without connecting passengers, enplanements will equal originating passengers. At hub airports, originating passengers are may be approximated as O&D passengers divided by two except at leisure destinations where that figure will overstate the number of passengers originating their journey at the relevant airport.

Important for self-benchmarking and peer benchmarking.

Example

Parking Revenue per Originating Passenger (Airports 1-5 Million Enplanements)



Source: FAA Form 127

Copyright National Academy of Sciences. All rights reserved.

PK K-1
Parking

Parking Revenue per Transaction

Definition

Average gross revenue per parking transaction during the year.

Data Sources

Airport records

Applicability

All airports

Comments

At commercial service airports, parking is usually the largest source of non-airline revenue, and subject to close management attention. A key measure used to assess parking revenue performance is revenue per transaction. Care must be taken to compensate for changes over time in the "mix" of parking offered. For example, a shift in passenger demand for long-term parking versus close-in daily parking would reduce the average revenue per space even though the average revenue per space in the daily parking area may remain strong. See ACRP Report 24, Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies, 2009, for useful parking metrics and factors to consider in benchmarking.

Useful for self-benchmarking, and with careful selection of peer airports, peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

174 Resource Guide to Airport Performance Indicators

PK K-2
Parking

Parking Spaces

Definition

Number of on-airport parking spaces by type of parking product.

Data Sources

Airport records

Applicability

All airports

Comments

Measures on-airport parking capacity. Must be used in conjunction with other measures to obtain an accurate overall picture of parking performance. Depending on space constraints, adding parking spaces may be impossible or cost-prohibitive. High-rise structured parking is substantially more expensive than surface lots and low-rise structures.

Useful for self-benchmarking. May be compared with other similarly-situated airports for general peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PK K-3
Parking

Parking Transactions per Month by Parking Product

Definition

Average number of parking transactions per month by parking product during the year.

Data Sources

Airport records

Applicability

All airports

Comments

By “parking product” is meant hourly, daily, long-term, valet, employee, and other categories of parking facilities/services.

Many airports closely track the number of parking transactions as the most important measure of changes in parking demand. See ACRP Report 24, Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies, 2009, for useful parking metrics and factors to consider in benchmarking.

This API is useful for self-benchmarking. When compared with the number of transactions in the prior period, may also be used for peer benchmarking against industry trends to the extent data is available.

Copyright National Academy of Sciences. All rights reserved.

PK K-4
Parking

Parking Utilization – Peak Period

Definition

Average number of parking spaces utilized, by parking product, during daily peak as percent of total number of parking spaces.

Data Sources

Airport records

Applicability

All airports

Comments

Measures parking utilization versus capacity. Useful for self-benchmarking. See ACRP Report 24, Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies, 2009, for useful parking metrics and factors to consider in benchmarking. Less useful for peer benchmarking.

Can also measure total overall parking utilization (peak and non-peak periods).

Copyright National Academy of Sciences. All rights reserved.

PK K-5
Parking

Privately-Operated Off-Airport Parking Spaces as Percent of Total Parking Spaces

Definition

Number of nearby privately-operated off-airport parking spaces as a percent of total on-airport and off-airport airport parking spaces.

Data Sources

Airport research

Applicability

All airports that compete with privately-operated off-airport parking.

Comments

Measures the amount of privately-operated off-airport parking, which will impact both the amount of airport parking required and the airport revenues generated by parking. The degree of competition with off-airport parking varies widely and will impact airport parking rates and revenue generated per passenger. Accurately estimating number of off-airport spaces may not be easy. Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PK K-6
Parking

Revenue per Day per Parking Space

Definition

Average revenue per day per parking space over the course of a year.

Data Sources

Airport records

Applicability

All airports

Comments

At commercial service airports, parking is usually the largest source of non-airline revenue, and subject to close management attention. A key measure used to assess parking revenue performance is revenue per parking space. Care must be taken to compensate for changes over time in the "mix" of parking offered. For example, a shift in passenger demand for long-term parking versus close-in daily parking would reduce the average revenue per space even though the average revenue per space in the daily parking area may remain strong. See ACRP Report 24, Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies, 2009, for useful parking metrics and factors to consider in benchmarking.

Useful for self-benchmarking, and with careful selection of peer airports, peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PK K-7
Parking

Vehicles Parked per Originating Passenger

Definition

Average number of vehicles parked per originating passenger.

Data Sources

Airport records

Applicability

All airports

Comments

Will be a function of the availability of public transportation, cost of airport parking, and availability of off-airport alternatives. See ACRP Report 24, Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies, 2009, for useful parking metrics and factors to consider in benchmarking. Should be tracked to discern trends that may affect airport parking demand in relation to air service. Useful for self-benchmarking, less useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Parking – Other APIs

No.	Indicator Name	Definition
PK O-1	Average Duration – Parking in LTP and STP	Average Duration – Parking in long-term parking and short-term parking
PK O-2	Average Gross Revenue per Vehicle Parked	Average gross revenue per vehicle parked
PK O-3	Long Term (Daily) Parking Spaces per O&D Passenger – Number of	Number of long-term (daily) parking spaces per o&d passenger
PK O-4	Maintenance Cost per Parking Space	A measure of the cost of parking facilities; can indicate a need for major repair or replacement
PK O-5	Occupancy in Airport Parking Facilities	Occupancy in airport parking facilities
PK O-6	Parking Demand by Day	Parking demand by day measured as vehicles parked by 24-hour period
PK O-7	Parking Demand by Hour	Parking demand by hour measured as cars parked per hour
PK O-8	Parking Gross Revenue	Parking gross revenues
PK O-9	Parking Gross Revenue per O&D Passenger	Parking gross revenues per total of O&D passengers
PK O-10	Parking Net Revenue to the Airport per O&D Passenger	Parking net revenue to the airport per total of O&D passengers
PK O-11	Parking Revenue Gross Sales	Parking revenue gross sales
PK O-12	Parking Revenue Net Revenue to Airport	Parking revenue net revenue received by the airport
PK O-13	Parking Spaces – Number On – and Off – Airport	Total number of parking spaces on – and off – airport
PK O-14	Parking Spaces per O&D Passenger – Number of	Number of parking spaces per O&D passenger
PK O-15	Ratio of Parking Net Revenue to Parking Gross Sales	Percentage of parking gross sales received by the airport
PK O-16	Short-Term Parking Spaces per O&D Passenger – Number of	Number of short-term parking spaces per O&D passenger
PK O-17	Utilization Level of Parking Spaces	Average number of parking spaces utilized per total number of parking spaces
PK O-18	Vehicles Parked per O&D Passenger	Vehicles parked per total of O&D passengers

Copyright National Academy of Sciences. All rights reserved.

Planning/Construction (PL)

Airport performance measures for planning and construction generally relate to three areas: keeping projects (1) on schedule; (2) within budget; and (3) within specification.

Core Indicators

Construction Projects – Actual vs. Budgeted Costs of Significant Projects ..... PL C-25

Key Indicators

Budget Spent versus Work Completed – Specific Significant Capital Projects ..... PL K-1
Change Orders as % of Base Budget – Specific Significant Capital Projects ..... PL K-2
Project Completion Relative to Schedule – Specific Significant Capital Projects ..... PL K-3
Project Cost versus Budget – Specific Significant Capital Projects ..... PL K-4

Related Core and Key Indicators

Safety/Risk Management

Construction Injuries ..... SR K-4

See Other Indicators in ..... ***Financial, Maintenance, Properties/Contracts, Safety/Risk Management***

Comments

- Because airport site conditions and project designs vary considerably, benchmarking is a challenge and apples-to-apples cost comparisons typically require an outside expert.

Copyright National Academy of Sciences. All rights reserved.

PL C-25
Planning/Construction

Construction Projects – Actual vs. Budgeted Costs of Significant Projects

Definition

Significant specific airport construction projects – actual cost versus budgeted cost.

Data Sources

Airport records

Applicability

All airports

Comments

Financing for significant airport capital projects may be one of the largest components of an airport's cost structure. This indicator measures the accuracy of the airport budgeting process and its ability to control costs during construction. Airport construction is an area that lacks widely-accepted APIs. Currently, this indicator is useful primarily for tracking trends over time. It is not readily susceptible to benchmarking with other airports because comparative data is not collected systematically. Also, what is significant to one airport may not be significant to another

Useful for self-benchmarking because during a CIP construction costs can represent a large part of an airport’s total costs. Also, because construction costs can often be more readily controlled than other cost areas. Not very useful for peer- benchmarking, although an index could be developed to relate one airport's success at staying within project budgets against another's

Copyright National Academy of Sciences. All rights reserved.

PL K-1
Planning/Construction

Budget Spent versus Work Completed – Specific Significant Capital Projects

Definition

Percent of budget spent versus percent of work completed for specific significant capital projects.

Data Sources

Airport records

Applicability

All airports

Comments

This API provides an early warning of projects that are running over budget. Similar to the Project Cost versus Budget measure, except that measure may not report budget overruns until projects are completed. One of the drawbacks of this API is that it may be difficult to obtain accurate data regarding percentage of work completed. Useful for self-benchmarking – tracking individual projects and the range of airport capital projects. Not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PL K-2
Planning/Construction

Change Orders as % of Base Budget – Specific Significant Capital Projects

Definition

Change order amount expressed as percent of base budget for specific significant capital projects.

Data Sources

Airport records

Applicability

All airports

Comments

A narrower measure than Project Cost versus Budget. That API includes projects that come in over budget for all reasons, including volume or market price changes in materials. Similarly, time and materials contracts may exceed initial budgets without involving change orders.

This measure tracks only budget increases resulting from change orders, as construction proceeds and upon completion.

Can also track the number of change orders or the number over a certain dollar amount.

Useful for self-benchmarking – tracking individual projects. May be useful for peer benchmarking – comparing against projects of similar complexity at other airports and organizations.

Copyright National Academy of Sciences. All rights reserved.

PL K-3
Planning/Construction

Project Completion Relative to Schedule – Specific Significant Capital Projects

Definition

Project completion progress relative to schedule for specific significant capital projects.

Data Sources

Airport records

Applicability

All airports

Comments

Measures whether important capital projects are on schedule and, if not, the extent of the slippage as construction proceeds and upon completion. One of the three basic construction questions: On time? On schedule? Meets specifications?

Useful for self-benchmarking – tracking individual projects. If airport construction projects are consistently behind schedule, may indicate project management issues. Not well-suited for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PL K-4
Planning/Construction

Project Cost versus Budget – Specific Significant Capital Projects

Definition

Project cost versus budget for specific significant capital projects.

Data Sources

Airport records

Applicability

All airports

Comments

Measures whether important capital projects are on budget and, if not, the extent of the cost overrun as construction proceeds and upon completion. One of the three basic construction questions: On time? On schedule? Meets specifications? Important to emphasize that this API measures budgeting accuracy as opposed to overall project cost discipline, as generous budgeting makes this an easy measure and tight budgeting makes this a difficult measure.

Useful for self-benchmarking – tracking individual projects. If airport construction projects are consistently over budget, may indicate project management issues. Not well-suited for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Planning/Construction – Other APIs

No.	Indicator Name	Definition
PL O-1	Airport Capital Improvement Program – Total Cost Estimate	Total airport capital improvement program (CIP) estimated costs
PL O-2	Airport Construction Costs – Total Actual	Total airport construction costs in a particular FY
PL O-3	Airport Construction Costs – Total Budgeted	Total budgeted airport construction costs for upcoming year(s)
PL O-4	Airport Master Plan and Strategic Plan Updates Completed in Timely Manner	Percentage of airport master plan and strategic plan updates completed in timely manner
PL O-5	Average Contract Planning and Bid Time	Average time required to develop a capital project bid package
PL O-6	Average Time to Settle Contractor Claims	Average time to settle contractor claims
PL O-7	Bid Estimate to Actual Bid	Ratio of dollar value of bid estimates to actual bids received
PL O-8	Budget Spent vs Percentage of Work Completed for Each Significant Airport Construction Project (%)	For each significant specific airport construction projects: percentage of budget spent versus percentage of work completed
PL O-9	Change Order Dollars as Compared to Original Contract Price (%)	Cost of change orders as percentage of original contract price
PL O-10	Change Orders – Number Outstanding for Each Significant Airport Construction Project	For each significant airport construction project: number of change orders outstanding
PL O-11	Change Orders – Number per Airport Construction Project	Average number of change orders per airport construction project
PL O-12	Claims Settled vs Initial Amount of Claims for Each Significant Airport Construction Project (%)	For each significant airport construction project: dollar amount of claims settled vs initial amount of claims
PL O-13	Consistent and Timely Plan Review and Permit Issuance (%)	Percentage of time consistent and timely plan review accomplished and permits issued
PL O-14	Construction Cost per Parking Space	A measure of the cost of constructing parking facilities
PL O-15	Contractor Claims – Number vs Number of Airport Construction Projects	Number of contractor claims compared to total number of airport construction projects
PL O-16	Contractor Claims Settled without Litigation vs Total Number of Claims	Claims settled without litigation vs total number of contractor claims
PL O-17	Design Changes – Number for Each Significant Airport Construction Project	For each significant airport construction project : number of design changes from initial design documents
PL O-18	Dollar Amount of Change Orders Outstanding for Each Significant Airport Construction Project	For each significant airport construction project: dollar amount of change orders outstanding
PL O-19	Dollar Amount of Contractor Claims vs Total Dollar Amount of Airport Construction Projects	Total dollar amount of contractor claims vs total dollar amount of airport construction projects
PL O-20	Dollar Value of Projects Completed	Capital projects completed in a given reporting period, expressed in dollars
PL O-21	Projects Completed – Number	The number of capital projects completed in a given reporting period
PL O-22	Punch List Items – Number Outstanding for Each Significant Airport Construction Project	For each significant airport construction project: number of punch list items outstanding
PL O-23	Schedule Performance for Each Significant Airport Construction Project	For each significant specific airport construction project: days ahead (behind)
PL O-24	Terminal Construction Cost per Passenger	Terminal construction cost per passenger on an annual basis

Copyright National Academy of Sciences. All rights reserved.

Police/Security (PS)

Airport performance measures for Police/Security generally track security violations, thefts, and crimes, and police costs.

Key Indicators

Air Operations Area (AOA) Violations ..... PS K-1
Crimes Reported on the Airport ..... PS K-2
Police & Security Guard Costs – Change over Prior Period ..... PS K-3
Police & Security Guard Costs per Enplanement ..... PS K-4
Security Responses within Established Response Time (%) ..... PS K-5
Sworn Police Officer Average Salary (5+ Years Experience) ..... PS K-6
Thefts Reported in Terminal Area ..... PS K-7

Related Core and Key Indicators

Safety/Risk Management

Vehicle Accidents on Airport Premises ..... SR K-9

See Other Indicators in ..... ***Airfield Operations, ARFF, Financial, Public Affairs, Safety/Risk Management, Terminal Operations***

Comments

- Watch for cross-trained police and fire personnel in comparing police costs.
- At present, there are few widely used police/security APIs.

Copyright National Academy of Sciences. All rights reserved.

PS K-1
Police/Security

Air Operations Area (AOA) Violations

Definition

Annual number of security rules violations that apply to the Air Operations Area.

Data Sources

Airport records

Applicability

All airports

Comments

Air Operations Area (AOA) means a portion of an airport, specified in the airport security program, in which security measures specified in Title 49 of the Code of Federal Regulations are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas, for use by aircraft and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures. Minimizing AOA violations requires constant vigilance by airport management and tenants.

Useful for self-benchmarking and peer benchmarking.

Example

Excerpt from Metropolitan Airports Commission Strategic Plan 2010-2015
Safety & Security Performance Indicators



MSP Runway Incursions & Airfield Violations	2004	2005	2006	2007	2008
Airfield Operations Area (AOA Violations)	4	3	13	5	2
Citations Issued	21	35	43	79	58
Warning Citations Issued	60	56	47	35	6
Runway Incursions	1	1	0	0	0

Source: Metropolitan Washington Airports Authority website

Copyright National Academy of Sciences. All rights reserved.

PS K-2
Police/Security

Crimes Reported on the Airport

Definition

Number of crimes reported at the airport annually.

Data Sources

Airport records

Applicability

All airports

Comments

A measure of effectiveness in controlling crime at the airport. Rising number of crimes reported may indicate need for additional police/security staffing or a different approach. Useful for self-benchmarking and peer benchmarking.

Should also measure crimes at specific high-risk areas and times, e.g., parking garages at night.

Copyright National Academy of Sciences. All rights reserved.

PS K-3
Police/Security

Police & Security Guard Costs – Change over Prior Period

Definition

Total cost of police and security guards per year, including airport employees and contracted services.

Data Sources

Airport records

Applicability

All airports

Comments

Useful for self-benchmarking and in relation to changes in enplanements and operations. May be used for peer benchmarking when compared with similarly-sized airports with similar characteristics, e.g., in a large urban and with a similar cost of living. In peer benchmarking, important to account for airports with public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

PS K-4
Police/Security

Police & Security Guard Costs per Enplanement

Definition

Total cost of police and security guards per year, including airport employees and contracted services, per enplanement.

Data Sources

Airport records

Applicability

All airports

Comments

Useful for self-benchmarking. May also be used for peer benchmarking when compared with similarly-sized airports with similar characteristics, e.g., in a large urban with a similar cost of living. For peer benchmarking, important to account for airports that have public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

PS K-5
Police/Security

Security Responses within Established Response Time (%)

Definition

Percent of security responses within established response time. Response time is measured from the time between receipt of a call and arrival of the first officer on the scene.

Data Sources

Airport records

Applicability

All airports

Comments

A critical service standard for police and other security service providers. Useful for measuring absolute level of performance and for self-benchmarking. May also be useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PS K-6
Police/Security

Sworn Police Officer Average Salary (5+ Years Experience)

Definition

Average salary of sworn police officer with 5 or more years' experience.

Data Sources

Airport records

Applicability

All airports

Comments

Useful for self-benchmarking, and peer benchmarking. For example, one grouping of peer airports might be Large Urban Airports with a Similar Cost of Living. Also important to account for airports that have public safety officers cross-trained to provide both police and fire response.

Copyright National Academy of Sciences. All rights reserved.

PS K-7
Police/Security

Thefts Reported in Terminal Area

Definition

Number of thefts reported in terminal area; may also be tracked in other areas, such as baggage claim, cargo area.

Data Sources

Airport records

Applicability

All airports

Comments

A measure of effectiveness in controlling crime at the airport. Rising number of thefts reported may indicate need for additional police and security staffing or a different approach. Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Police/Security – Other APIs

No.	Indicator Name	Definition
PS O-1	Active-Duty Sworn Police Officers – Number of	Number of active-duty sworn police officers
PS O-2	Airport Employees (FTEs) Dedicated to Security Badging and Credentialing– Number of	Number of airport employees (FTEs) dedicated to security badging and credentialing
PS O-3	Average Downtime for Passenger Screening Equipment	Average downtime for passenger screening equipment
PS O-4	Average Length of Time for Processing Security Badging and Credentialing Applications	Average length of time for processing security badging and credentialing applications
PS O-5	CCTV-Equipped Airfield and Perimeter Security Checkpoints – Number of	Number of airfield and perimeter security checkpoints equipped with CCTV
PS O-6	CCTV-Equipped Airfield and Perimeter Security Checkpoints to Total (%)	Percentage of CCTV-equipped airfield and perimeter security checkpoints to total
PS O-7	CCTV-Equipped Passenger Security Screening Checkpoints – Number of	Number of passenger security screening checkpoints equipped with CCTV
PS O-8	CCTV-Equipped Passenger Security Screening Checkpoints to Total (%)	Percentage of CCTV-equipped passenger security screening checkpoints to total number of checkpoints
PS O-9	Cost of Police Officers Assigned to Airfield and Perimeter	Cost of police officers assigned to airfield and perimeter
PS O-10	Cost of Police Officers Assigned to Passenger Screening	Cost of police officers assigned to passenger screening
PS O-11	Curb Time per Arriving Vehicle	Measures dwell time on airport curbs. Aids in assessing roadway capacity.
PS O-12	Failure to Challenge Violations	Failure to challenge violations per year
PS O-13	Failure to Display Security Badge Violations	Failure to display security badge violations per year
PS O-14	Flexibility of Police Staffing.	Ability of police management to extend duty tours forward or back, bring off-duty officers in, etc.
PS O-15	Overtime Cost as Percentage of Police Salary and Benefits Cost	Police overtime cost as percentage of police salary and benefits cost
PS O-16	Overtime Cost for LEOs Assigned to Airfield and Perimeter Security	Overtime cost for LEOs assigned to airfield and perimeter security
PS O-17	Overtime Cost tor Police Officers Assigned to Passenger Screening	Overtime cost for police officers assigned to passenger screening
PS O-18	Piggybacking Violations per Year	Piggybacking violations per year
PS O-19	Police Cost per Enplanement	Total police department cost per enplaned passenger
PS O-20	Police Cost per Security Checkpoint	Total police department cost per security checkpoint manned or under quick-response
PS O-21	Police Department Cost per Sworn Officer	Total police department cost per sworn officer
PS O-22	Police Department Salary & Benefits Cost	Police department salary & benefits cost
PS O-23	Police Management Employees Other than Active-Duty Sworn Officers	Number of police management employees who are not active-duty sworn officers
PS O-24	Police Officers Assigned to Passenger Screening – Number	Number of police officers assigned to passenger screening
PS O-25	Police Overtime Cost	Cost of police overtime
PS O-26	Police Overtime Cost as Percentage of Total Police Department Cost	Police overtime cost as percentage of total police cost
PS O-27	Police Response within Federal Security Requirements per Number of Police Security Responses	Percentage of police responses within federal security requirements per total police security responses

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
PS O-28	Police Responses within Federal Security Requirements	Number of police officer responses within federal security requirements
PS O-29	Security Alarms – Airfield and Perimeter – Number of	Number of security alarms – airfield and perimeter
PS O-30	Security Alarms Terminal Area – Number of	Number of security alarms terminal area
PS O-31	Security Badges Pulled – Number of	Number of security badges pulled
PS O-32	Security Breaches and Violations	Number of security breaches and violations, including failure to display badge, piggybacking, failure to challenge
PS O-33	Security Checkpoint Throughput Times	Time for passengers to pass through security
PS O-34	Security Cost per Enplaned Passenger	Security cost per enplaned passenger
PS O-35	Security False Alarms Terminal Area – Number of	Number of security false alarms terminal area
PS O-36	Security FTE Headcount	Security FTE Headcount
PS O-37	Security Inspections Conducted – Number of	Number of security inspections conducted
PS O-38	Terminal Security Evacuations – Number of	Number of terminal security evacuations
PS O-39	Thefts in Passenger Screening Areas – Number of	Number of thefts in passenger screening areas
PS O-40	Total Police Department Employees	Total police department employees
PS O-41	Traffic Management Cost per Enplanement	Traffic management cost per enplaned passenger
PS O-42	Traffic Tickets Issued – Number of	Number of traffic tickets issued
PS O-43	Violation of Security Rules Airfield and Perimeter	Number of violations of security rules airfield and perimeter
PS O-44	Warning Citations Issued per Year	Warning citations issues – per year

Copyright National Academy of Sciences. All rights reserved.

Properties/Contracts (PC)

Airport performance measures for Properties/Contracts generally track rates charged for landing fees and facilities rent as well as a variety of real estate- and contract-related issues.

Core Indicators

Landing Fee Rate ..... PC C-26

Key Indicators

Hangar Rental Rates Compared to Nearby Airport ..... PC K-1
Passenger Airline Aeronautical Fees ..... PC K-2
Percent of Hangar Space Leased ..... PC K-3
Percent of Terminal Space Leased ..... PC K-4
Terminal Rental Rate ..... PC K-5

Related Core and Key Indicators

Financial

Airline Cost per Enplanement ..... FN C-9
Airport Cost per Enplanement ..... FN C-10
Airline Cost per Operation ..... FN K-2

Legal

Contract Reviews Completed on Time (%) ..... LG K-1

See Other Indicators in ..... ***Financial, Legal***

Comments

- The Properties/Contracts area is closely related to the Financial area, as it deals with commercial rates, fees, costs and contracts. In most airports this area includes a special focus on airline relations and cost control issues.
- A number of other important financial indicators are found in the Financial category.

Copyright National Academy of Sciences. All rights reserved.

PC C-26
Properties/Contracts

Landing Fee Rate

Definition

Rate paid by airlines and other airfield users for each 1,000 lbs aircraft weight landed. Excludes fees for parking aircraft. Excludes weights of G.A. and military aircraft.

Data Sources

Landing Fee Rate - airport records. Certificated aircraft weight - FAA records.

Applicability

All commercial service, cargo, and some general aviation airports that charge a landing fee. The landing fee rate is a frequently used by airlines and cargo carriers as one important measure of the cost of serving an airport.

Comments

Most airports apply the landing fee rate to aircraft based on the maximum certificated landed weight of the aircraft.

The landing fee rate is typically derived from a formula in the airport use/operating agreement designed to recover the airport's cost of operating the airfield. Airline and other operators not party to the use/operating agreement usually pay a higher "non-signatory" fee rate, typically 25% to 50% higher than the "signatory airline" rate. Should differentiate between the landing fee rate being charged during the course of a year and the “post-settlement” final rate after taking all relevant costs and revenues and actual landed weights into account.

A small number of U.S. airports, including Kennedy and Newark, plus many foreign airports, charge a "landing" fee based on maximum certificated take-off weight, which has the effect of decreasing the landing fee rate relative to that charged on the basis of maximum certified landed weight. However, since the smaller fee rate is applied against the correspondingly larger takeoff weight value, the total landing fee charge collected is the same.

The formula for calculating the landing fee rate on a cost-recovery basis is common to most airports: airfield costs (collected in the Airfield Cost Center) are divided by landed weight (or takeoff weight, as applicable). However what “Airfield Costs” includes can vary from airport to airport. Differentiating factors include: does the Airfield Cost Center collect certain costs not recovered in other cost centers (an airport “total residual” approach)? Also, what if any credits are applied to reduce the size of the Airfield Cost Center number? Because of these differences, the landing fee rate does not always serve as an accurate measure of airport or airfield costs, or of airline charges. Nevertheless, this highly visible charge is widely used for both airport fee self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PC K-1
Properties/Contracts

Hangar Rental Rates Compared to Nearby Airport

Definition

Average hangar rental rate compared to nearby airport.

Data Sources

Airport records

Applicability

All airports with hangars for lease

Comments

Of most importance for general aviation airports. However, may also be important for commercial service airports where airline or corporate tenants are considering alternate locations. Useful for self-benchmarking and peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PC K-2
Properties/Contracts

Passenger Airline Aeronautical Fees

Definition

All revenue derived by the airport from aeronautical use of the airport by passenger airlines. Includes payments to the airport for use of airfield (landing fees, ramp/apron fees) and terminal space (space rentals net of any credits and reimbursements; gate charges). Includes payments for aircraft parking positions (e.g., hard stands, tie-downs). Includes federal inspection fees. Does not include ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars). Does not include airline self-funded construction (e.g., build-out of terminal space). Does not include the multitude of significant other costs incurred by the airline to operate at the airport, e.g., fuel, aircraft payment, operation and maintenance, personnel, services, supplies and equipment.

Data Sources

Airport records and FAA Form 127

Applicability

All commercial service airports

Comments

This API provides the numerator used to calculate the widely-used indicator -- airline cost per enplanement. One benefit of tracking changes in this indicator is that it is more within the airport's control, as it is not subject to changes as a result of changing passenger enplanements. FAA Form 127 captures this measure, along with further breakdowns into passenger airline terminal fees; terminal arrival fees, rents, and utilities; terminal area apron charges/tiedowns; federal inspection fees; and other passenger aeronautical fees.

Important to note that the ACI-NA definition includes federal inspection fees, and security reimbursements paid by the airline whether to the airport or another agency.

Useful for self-benchmarking and, taking account of differences in costs included/excluded from airport-to-airport, for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PC K-3
Properties/Contracts

Percent of Hangar Space Leased

Definition

Percent of hangar space that is leased, as of end of reporting period.

Data Sources

Airport records

Applicability

All airports with hangars for lease. May be particularly important for GA airports.

Comments

Hangar rental is often a significant source of revenue for general aviation and commercial service airports. In some cases, changes in airline maintenance patterns have left airports with major hangar facilities unleased. Useful for self-benchmarking and peer benchmarking comparisons on a nationwide basis.

Copyright National Academy of Sciences. All rights reserved.

204 Resource Guide to Airport Performance Indicators

PC K-4
Properties/Contracts

Percent of Terminal Space Leased

Definition

Percent of leasable terminal space that is leased to airlines and other tenants, as of the end of a reporting period.

Data Sources

Airport records

Applicability

All airports

Comments

As with other landlords, airports seek to minimize unleased space. This measure tracks unleased terminal space of all forms, including gates, ticket counter, operations space, and commercial space. Useful for self-benchmarking, as the airport seeks to minimize unleased space. Since airport lease agreements treat unleased space differently this measure is not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PC K-5
Properties/Contracts

Terminal Rental Rate

Definition

Average rental rate per square foot of terminal space.

Data Sources

Airport records

Applicability

Commercial service airports

Comments

At some airports, airlines and other tenants are charged the same rate per square foot, regardless of the type of space involved. At many airports, however, the average rate is used as the basis to calculate weighted terminal rates. See the example below.

Useful for self-benchmarking so long as airport does not change ratemaking methodology year-to-year in a way that impacts the results. Less useful for peer benchmarking because of differing methodologies used to calculate rentable square footage.

Example

Weighted Terminal Rates

Airline Space Type	Average Terminal Rental Rate	Weighting Factor	Weighted Terminal Rental Rate
Type I - Ticket Counter	$40.00	1.50	$60.00
Type II – Holdroom	$40.00	1.25	$50.00
Type III - Baggage Claim	$40.00	1.00	$40.00
Type IV - Bag Makeup	$40.00	0.75	$30.00

Source: *Airport/Airline Agreements – Practices and Characteristics, Report 36 (2010)*

Copyright National Academy of Sciences. All rights reserved.

Properties/Contracts – Other APIs

No.	Indicator Name	Definition
PC O-1	Accuracy of Airline Leased Premises Drawings	Accuracy of airline leased premises drawings
PC O-2	Acreage Available for Development – Airfield	Area of airfield available for development as new aeronautical or revenue-producing uses
PC O-3	Acreage Available for Development – Non-Airfield	Non-airfield area of airport available for development as new revenue-producing uses
PC O-4	Airfield Acreage Developed	Area of airfield developed for aeronautical and revenue-producing uses
PC O-5	Airport Data Reporting to Airlines and Other Key Tenants	Completeness and timeliness of airport data reporting to airlines. Particularly important in advance of rates & charges meetings.
PC O-6	Average Acquisition Cost of Land per Square Foot	Average acquisition cost of land per square foot
PC O-7	Average Time to Process Routine Lease Extensions/Amendments	Average time to process routine lease extensions/amendments
PC O-8	Contract Deadlines Missed	Number of contract deadlines missed
PC O-9	Contract Extensions – Number Given	Number of contract extensions given
PC O-10	Contract Management Billing	Percentage of invoices that are accurate, complete, justified and submitted on a timely basis
PC O-11	Contracts in Place by Renewal/Start Date (%)	A measure of the effectiveness of the airport staff to successfully negotiate contracts in a timely manner
PC O-12	Contracts/Leases – Number Negotiated and Executed	Number of contracts/leases negotiated and executed
PC O-13	Maintain Effective Working Relationship with Airline Tenants – Subjective	Maintain effective working relationship with airline tenants
PC O-14	Private Sector Contracts – Number of	Number of private sector contracts at airport at a given point of time or during a given period
PC O-15	Promptness of Payment to Vendors and Contractors	Average number days to pay vendors
PC O-16	Properties Contract Administration – Accuracy of Tracking in Database	Properties contract administration – tracking in database
PC O-17	Property Transactions Completed on Timely Basis as Required by CIP – Percent	Percentage of property transactions completed on timely basis as required by CIP

Copyright National Academy of Sciences. All rights reserved.

Public Affairs (PA)

Airport performance measures for Public Affairs generally track responsiveness, media mentions, and public complaints about the airport.

Key Indicators

Community Complaints – Average Time to Respond..... PA K-1
Community Complaints – Number Received..... PA K-2
Media Inquiries – Number Received ..... PA K-3
Media Mentions – Number..... PA K-4

Related Core and Key Indicators

Service Quality

Customer Satisfaction with Airport..... SQ C-29

Environmental

Noise – Number of Homes within 65 dBA DNL ..... EV K-8

Safety/Risk Management

Runway Incursions.....SR C-28
Accidents and Incidents on Airport Premises ..... SR K-1

See Other Indicators in ..... ***Environmental, Safety/Risk Management, Service Quality***

Comments

- Public Affairs metrics often deal with the timeliness with which the airport deals with community and other stakeholder complaints.
- Measures of noise and other environmental complaints are important from a Public Affairs perspective and should be tracked.
- The public's overall level of satisfaction with the airport is also a useful Public Affairs indicator.

Copyright National Academy of Sciences. All rights reserved.

PA K-1
Public Affairs

Community Complaints – Average Time to Respond

Definition

Average time to respond to community complaints.

Data Sources

Airport records

Applicability

All airports

Comments

Airports often set prompt response goals as a way of responding to community concerns. Useful for self-benchmarking, not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PA K-2
Public Affairs

Community Complaints – Number Received

Definition

Number of community complaints received, generally tracked by category.

Data Sources

Airport records

Applicability

All airports

Comments

Measures the impact of the airport as perceived by the community, segments of the community, and individuals concerned about noise, environmental, development and other issues. Gives a rough indication of the effectiveness of the airport's community relations program. Useful for self-benchmarking, not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PA K-3
Public Affairs

Media Inquiries – Number Received

Definition

Number of media inquiries directed to the airport, measured monthly, quarterly, or annually.

Data Sources

Airport records

Applicability

All airports

Comments

Many airports track media inquiries. This API is useful as an indicator of the amount of media interest in the airport. Sometimes media inquiries are compared with media mentions (positive or negative) to evaluate track whether the airport is providing appropriate media attention and support. Useful for self-benchmarking, not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

PA K-4
Public Affairs

Media Mentions – Number

Definition

Number of media mentions of the airport, measured monthly quarterly, or annually.

Data Sources

Airport records

Applicability

All airports

Comments

Many airports track media mentions, categorizing them as positive or negative. Useful to indicate the amount of media coverage the airport is receiving, and whether that attention is positive is negative. Useful for self-benchmarking; not useful for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

Public Affairs – Other APIs

No.	Indicator Name	Definition
PA O-1	Community Outreach Activities – Number of	Number of community outreach activities conducted within a certain period, typically a year
PA O-2	Media Calls Responded to within the Same Day – Number of	Percentage of media calls responded to within the same day
PA O-3	Media Outreach Contacts – Number of	Number of media outreach contacts made by airport staff within a certain period, typically a year
PA O-4	People Taking Airport Tours – Number of	Number of people taking airport tours
PA O-5	Positive vs. Negative Mentions (%)	Percentage of positive and negative media mentions to total
PA O-6	Press Releases Issued – Number of	Number of press releases issued within a certain period, typically a year
PA O-7	Response Time to Community Complaints	Response time to community complaints
PA O-8	Tours Conducted and Special Events Sponsored – Number of	Number of tours conducted and special events sponsored by airport staff

Copyright National Academy of Sciences. All rights reserved.

Safety/Risk Management (SR)

The airport performance measures for Safety/Risk Management are a diverse set of indicators measuring accidents, injuries, and unsafe practices, and their consequences.

Core Indicators

Employee Accidents and Injuries – Lost Work Days ..... SR C-27
Runway Incursions..... SR C-28

Key Indicators

Accidents and Incidents on Airport Premises ..... SR K-1
Aircraft Accidents and Incidents ..... SR K-2
Annual Part 139 Inspection Results..... SR K-3
Construction Injuries ..... SR K-4
Injuries per FTE ..... SR K-5
Lost Work Days per FTE ..... SR K-6
OSHA-Reportable Injuries ..... SR K-7
Safety Code Violations ..... SR K-8
Vehicle Accidents on Airport Premises..... SR K-9
Workers Compensation Claims Paid ..... SR K-10

Related Core and Key Indicators

Airfield Operations

FOD – Number of Items Found per Inspection..... AO K-2
Wildlife/Bird Strikes ..... AO K-6

ARFF

Airport Medical Emergency Responses within Established Standards ..... AR K-5

Environmental

Deicing – % Fluid Recovered ..... EV K-2
Environmental Violations – Number of NOVs..... EV K-5
Reportable Discharges, Number ..... EV K-9

Maintenance

Escalators, Moving Walkways, and Elevators – Percent of Time in Service..... MN K-3

Police/Security

Air Operations Area (AOA) Violations..... PS K-1
Crimes Reported on the Airport ..... PS K-2
Security Responses within Established Response Time (%) ..... PS K-5

See Other Indicators in ..... ***Airfield Operations, ARFF, Environmental, Human Resources, Maintenance Police/Security***

Copyright National Academy of Sciences. All rights reserved.

SR C-27
Safety/Risk Management

Employee Accidents and Injuries – Lost Work Days

Definition

Lost work days from employee injuries since last reporting period.

Data Sources

Airport records, including OSHA reportable injuries and workers compensation claims.

Applicability

All airports

Comments

A variety of metrics may be used to measure employee accidents and injuries, including injuries per FTE, lost work days, workers compensation experience rating. Bureau of Labor Statistics (BLS) data on work-related injuries, illnesses, and fatalities come from two sources: the Census of Fatal Occupational Injuries (CFOI) and the Survey of Occupational Injuries and Illnesses (SOII). The CFOI obtains information on workplace fatalities from multiple documentary sources, including death certificates, Occupational Safety and Health Administration (OSHA) reports, news media reports, state workers' compensation claims, and coroner or medical examiner reports. The SOII obtains information on nonfatal injuries and illnesses based on a large annual survey in which BLS calculates injury and illness rates by dividing the number of injuries and illnesses in a given industry by the total number of hours worked by all employees in that industry. Further breakdowns into types and locations of injuries, plus airport functional areas/departments involved, will provide useful additional information for analysis and prevention.

Important for self-benchmarking, less important for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

SR C-28
Safety/Risk Management

Runway Incursions

Definition

Number of occurrences involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.

Data Sources

Airport, ATC records. Also ASRS.

Applicability

All airports

Comments

FAA definition changed in 2007 to match ICAO definition. ICAO defines a runway incursion as any unauthorized intrusion onto a runway, regardless of whether or not an aircraft presents a potential conflict. For the FAA, an incident without an aircraft in potential conflict – such as an unauthorized aircraft crossing an empty runway – was defined as a "surface incident" and not a runway incursion. The Aviation Safety Reporting System (ASRS) receives, processes, and analyzes reports of unsafe occurrences and hazardous situations that are voluntarily submitted by pilots, air traffic controllers, and others. Can be compared with number in prior reporting period(s).

Runway incursions occur for multiple reasons, and the airport must focus on those within its control. Certain incursions are within airport control, e.g., when caused by an airport-operated vehicle. In other situations control may be less evident or only partial, but still significant, e.g., where faulty signage contributes to an incursion.

Very important for self-benchmarking, also important for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

SR K-1
Safety/Risk Management

Accidents and Incidents on Airport Premises

Definition

Number of accidents and incidents that cause injury or illness on airport premises annually.

Data Sources

Airport records. OSHA reports capture OSHA reportable events.

Applicability

All airports

Comments

Airports may track absolute number and then analyze further to look for patterns and causes of specific accidents and incidents. Useful for self-benchmarking, also peer benchmarking with airports and other enterprises for insights into best practices. May be converted to per-enplanement basis to facilitate benchmarking. Insurance carriers have other useful information on industry averages accessible through the airport's carrier.

Example

Ted Stevens Anchorage International Airport
Performance and Results Summary

Target #1: Reduce the rate of public injuries and incidents per enplaned passenger.

Total number and rate of public injuries and incidents per 100,000 enplaned passengers.

Fiscal Year	Total #	Rate	Total Enplaned Passenger
FY 2008	30	1.2%	2,562,276
FY 2007	41	1.7%	2,429,480
FY 2006	87	3.6%	2,408,171
FY 2005	45	1.9%	2,392,920
FY 2004	58	2.6%	2,250,680

Methodology: Data is reported on a fiscal year basis.

Analysis of results and challenges: Safety and security of the traveling public is the number one priority at the airport. Through investigations incident causes and locations are determined and corrective action is taken. Also, prevention maintenance such as sanding/salting roads and walkways is a constant winter activity at the airport. Injuries are reported through dispatch operations, and figures include incidents where someone files a claim.

Source: Alaska website, http://www.gov.state.ak.us/omb/results/view_details.php?p=220

Copyright National Academy of Sciences. All rights reserved.

SR K-2
Safety/Risk Management

Aircraft Accidents and Incidents

Definition

Number of aircraft accidents and incidents – tracked separately.

Data Sources

Airport records. Also NTSB Accident Database and FAA Incident Database.

Applicability

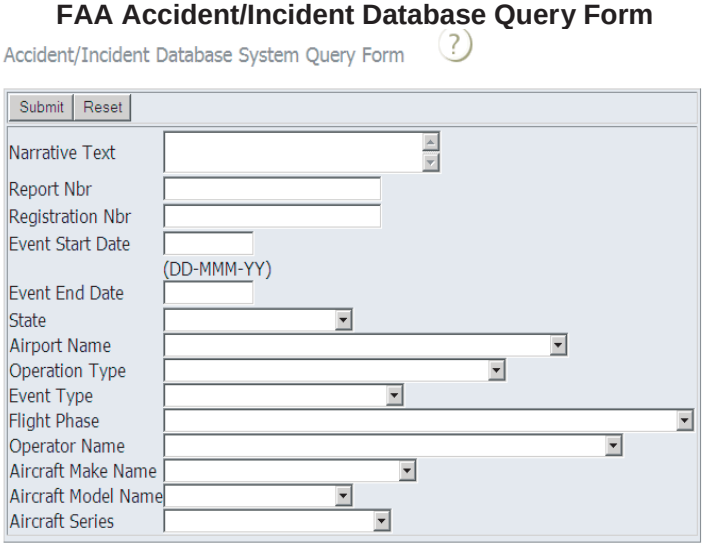
All airports

Comments

The FAA's Aviation Safety Information Analysis and Sharing System (ASIAS) includes an Accident/Incident Data System (AIDS) database (see example below) that contains incident information gathered from several sources including incident reports on FAA Form 8020-5. ASIAS uses the National Transportation Safety Board (NTSB) accident database as the primary source for accident information. Aircraft accidents and incidents occur for many reasons, of which the airport must focus on the relatively small portion within its control or influence (e.g., accidents involving as a factor sub-standard signage or lighting). Although safety is an airport's highest priority, the rarity of accidents and incidents and lack of airport control over most accidents which result from operator error may make this indicator less useful than might be expected.

Important for self-benchmarking, less important for peer benchmarking.

FAA Accident/Incident Database Query Form



Source: FAA website

Copyright National Academy of Sciences. All rights reserved.

SR K-3
Safety/Risk Management

Annual Part 139 Inspection Results

Definition

Number of deficiencies identified in airport's annual Part 139 inspection by FAA.

Data Sources

Airport records

Applicability

All airports

Comments

Airports strive for continuous compliance with Part 139 and to achieve a zero discrepancy rating. This API tracks the number of deficiencies identified in the annual inspection, and provides guidance to the airport on areas that need focus. Useful for self-benchmarking and for peer benchmarking. Airports have control over this API.

Example

Excerpt from Airport Press Release Announcing Inspect Results

Officials at _____ Airport are celebrating the successful passing of the Federal Aviation Administration's (FAA) annual certification inspection. During the inspection period conducted from May 5 through May 9, the Airport received a zero discrepancy rating which means there were no notices of corrective action.

Copyright National Academy of Sciences. All rights reserved.

SR K-4
Safety/Risk Management

Construction Injuries

Definition

OSHA Recordable injury rate per 200,000 work hours (equivalent to 100 full-time employees annually).

Data Sources

Contractor or OSHA records

Applicability

All airports with significant construction projects

Comments

The OSHA recordable injury rate is widely used in the airport industry to describe and evaluate the safety performance of a project or a construction firm. The measure captures injuries requiring medical care or causing lost time. Employers record any work-related injury or illness that results in death, days away from work, medical treatment beyond first aid, diagnosed by a physician or other licensed health professional, any case requiring medical removal of an employee, etc. Further breakdowns into types and locations of injuries and functional departments involved will provide additional useful information for analysis and prevention.

Where an airport contractor is involved, although the contractor has immediate control over its workforce, airport management can use this API and its derivatives to promote safe workplaces and practices and mandate improvements as indicated.

Very important for self-benchmarking, less important for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

SR K-5
Safety/Risk Management

Injuries per FTE

Definition

Number of injuries per airport employee FTE.

Data Sources

Airport records

Applicability

All airports

Comments

Measures number of injuries against airport employee FTEs. This measure is based on total employee injuries, as opposed to OSHA-reportable injuries, and therefore will use a higher numerator than would a measure based on OSHA-reportable injuries. Trends are important, as are causes of the injuries. Useful for self-benchmarking, also peer benchmarking to the extent data is available.

Copyright National Academy of Sciences. All rights reserved.

SR K-6
Safety/Risk Management

Lost Work Days per FTE

Definition

Number of work days lost to occupational illness or injury per airport employee FTE.

Data Sources

Airport records

Applicability

All airports

Comments

Measures number of work days lost per employee due to occupational illness or injury. Many airports consider this a particularly important measure of occupational injuries. Trends are important, as are causes of the injuries. Useful for self-benchmarking, also peer benchmarking to the extent data is available.

Copyright National Academy of Sciences. All rights reserved.

SR K-7
Safety/Risk Management

OSHA-Reportable Injuries

Definition

Number of OSHA-reportable injuries annually to airport employees.

Data Sources

Airport records

Applicability

All airports

Comments

In general, OSHA reportable injuries are any fatality, injury, or illness that is work related and involve: death, days away from work, restricted work activity, transfer to another job, medical treatment beyond first aid, loss of consciousness, or injury or illness diagnosed by a doctor. The airport's safety/risk management specialist is key in using this and related APIs. Also, see the OSHA Record Keeping Page at: http://www.osha.gov/recordkeeping/index.html. Note that OSHA publishes Employment Specific Injury & Illness Rates. May be difficult to obtain information about tenant injuries.

Airports may track absolute number of OSHA reportable injuries and then analyze further to look for patterns and causes of specific accidents. Important for self-benchmarking, less important for peer benchmarking.

Copyright National Academy of Sciences. All rights reserved.

SR K-8
Safety/Risk Management

Safety Code Violations

Definition

Number of safety code violations annually, divided into violations for which the airport is responsible and tenant violations.

Data Sources

Airport records and local code enforcement records

Applicability

All airports

Comments

Airports strive for and often attain a zero safety code violation result. Useful for self-benchmarking, also for peer benchmarking to the extent comparable data is available. Airport has control over safety code violations caused by its own actions; less control over safety code violations by tenants.

Copyright National Academy of Sciences. All rights reserved.

SR K-9
Safety/Risk Management

Vehicle Accidents on Airport Premises

Definition

Number of vehicle accidents occurring on airport premises annually.

Data Sources

Airport records

Applicability

All airports

Comments

Airports may track the absolute number of vehicle accidents (including those occurring on public roadways), then perform further analysis to find patterns and causes of specific accidents. Useful for self-benchmarking, less useful for peer benchmarking. Limited airport control unless accidents are related to airport design or signage issues.

Copyright National Academy of Sciences. All rights reserved.

SR K-10
Safety/Risk Management

Workers Compensation Claims Paid

Definition

Annual dollar value of workers compensation claims paid.

Data Sources

Airport records

Applicability

All airports

Comments

Measures amount paid by airport workers compensation insurance for work-related injuries or death. Trends are important, as are causes of the injuries. Useful for self-benchmarking, also peer benchmarking against experience rates of other airports to the extent that information is available. Workers compensation programs are administered on a state-by-state basis. The responsible agencies can provide Information about Experience Modification Factors and other statistics.

Copyright National Academy of Sciences. All rights reserved.

Safety/Risk Management – Other APIs

No.	Indicator Name	Definition
SR O-1	Attendees at Safety Seminars – Number of	Number of attendees at safety seminars
SR O-2	Accidents on Airport-Maintained Roads and Sidewalks – Number of	Number of accidents on airport-maintained roads and sidewalks
SR O-3	Aircraft Damage During Snow Event	Aircraft damage during snow event
SR O-4	Airfield Citations Issued	Airfield citations issued
SR O-5	Annual Safety Inspection – Number of Major Items Passed per Total Number of Major Items	FAA part 139 annual inspection – number of major items passed per total number of major items
SR O-6	Claim Cost per Million Enplaned Passengers	A measure of the cost of insurance claims against the airport
SR O-7	Concessionaires and Airlines Participating in Airport-Wide Safety Programs – Number of	Number of concessionaires and airlines participating in airport-wide safety programs
SR O-8	Cost of Claims from On-the-Job Employee Injuries per $100 of Total Airport Payroll	Incurred cost of claims from on-the-job employee injuries per $100 of total of airport payroll
SR O-9	Cost of Damages to Aircraft During Adverse Weather Events Other than Snow/Ice	Cost of damages to aircraft during adverse weather events other than snow/ice
SR O-10	Cost of Damages to Terminals, Other Structures, During Adverse Weather Events Other than Snow/Ice	Cost of damages to terminals, other structures, during adverse weather events other than snow/ice
SR O-11	Cost of Property Damage – On-Airport Accidents – Airport Operator	Cost of property damage – on-airport accidents – airport operator
SR O-12	Cost of Property Damage – On-Airport Accidents – Total Airport	Cost of property damage – on-airport accidents – total airport
SR O-13	Days without Serious Accident/Injury on Airport Construction Projects	Days without serious accident/injury on airport construction projects
SR O-14	Employee Lost Time to Illness or Accident – Airport Operator	Employee lost time to illness or accident – airport operator
SR O-15	Fatalities on Airport Construction Projects – Number of	Number of fatalities on airport construction projects in a particular year
SR O-16	Frequency of FOD Inspections	Frequency of FOD inspections
SR O-17	Ground Equipment Damage During Snow/Ice Events	Damage to ground equipment during snow/ice events
SR O-18	Injuries and Incidents – Passengers and Other Public On-Airport – Number of	Number of injuries and incidents – passengers and other public on-airport
SR O-19	Insurance Premium Costs per Enplaned Passenger	Insurance premium costs per enplaned passenger
SR O-20	Occupational Injuries and Illness – Total Airport – Number of	Number of occupational injuries and illness – total airport
SR O-21	Occupational Injuries and Illnesses – Airport Operator – Compared with National Averages – Number of	Number of occupational injuries and illnesses – airport operator – compared with
SR O-22	Runway Incursions by Aircraft During Adverse Weather	Runway incursions during snow event – aircraft
SR O-23	Runway Incursions by Aircraft During VMC	Runway incursions by aircraft during VMC
SR O-24	Runway Incursions by Ground Vehicles During Adverse Weather	Runway incursions by ground vehicles during snow events
SR O-25	Runway Incursions by Ground Vehicles During VMC	Runway incursions by ground vehicles (non-snow events)

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
SR O-26	Safety Seminars Conducted – Number of	Number of safety seminars conducted
SR O-27	Serious Accidents/Injuries on Airport Construction Projects – Number of	Number of serious accidents/injuries on airport construction projects in a particular year
SR O-28	Wildlife/Bird Alerts	Wildlife/bird alerts
SR O-29	Wildlife/Bird Strikes – Aircraft, per Number of Aircraft Operations	Wildlife/bird strikes – aircraft, per number of aircraft operations
SR O-30	Workers Compensation Claims – Number	Workers compensation claims – number
SR O-31	Workers Compensation Experience Rating Modification Factor	Workers compensation experience rating modification factor

Copyright National Academy of Sciences. All rights reserved.

Service Quality (SQ)

Airport performance measures for Service Quality focus on passenger perception of and objective measures of airport service delivery.

Core Indicators

Customer Satisfaction with Airport ..... SQ C-29

Key Indicators

Airport Cleanliness – Passenger Perception ..... SQ K-1
Airport Courtesy – Passenger Perception ..... SQ K-2
Arrival Delay per Flight ..... SQ K-3
Baggage Claim – Passenger Perception ..... SQ K-4
Departure Delay per Flight ..... SQ K-5
Ease of Connection – Passenger Perception ..... SQ K-6
Percent of Arriving Flights Delayed ..... SQ K-7
Percent of Departing Flights Delayed ..... SQ K-8
Wait Times at Major Processing Sites Other than Security Checkpoints ..... SQ K-9
Wait Times at Security Checkpoints ..... SQ K-10
Wayfinding – Passenger Perception ..... SQ K-11

Other Related Core and Key Indicators

Airfield Operations
Closures for Adverse Weather ..... AO K-1
Runway Clearing Time – Average for Snow/Ice ..... AO K-4
Taxi Time – Gate to Runway End, Peak vs. Unimpeded ..... AO K-5
Human Resources
Employee Job Satisfaction ..... HR K-6
Training Hours per Employee ..... HR K-9
Information Technology
Network-in-Service Time (%) ..... IT K-2
Public Affairs
Community Complaints – Average Time to Respond ..... PA K-1
Community Complaints – Number Received ..... PA K-2
Media Inquiries – Number Received ..... PA K-3
Media Mentions – Number ..... PA K-4
Maintenance
Escalators, Moving Walkways, and Elevators – Percent of Time in Service ..... MN K-3
Police/Security
Crimes Reported on the Airport ..... PS K-2

See Other Indicators in ..... *Airfield Operations, ARFF, Concessions, Human Resources, Information Technology, Parking, Public Affairs, Maintenance, Police/Security, Safety/Risk Management, Terminal Operations*

Comments

- Service Quality indicators have become a primary focus of airports over the past several years, with several organizations conducting detailed passenger surveys to help airport managers address perceived service deficiencies.

Copyright National Academy of Sciences. All rights reserved.

230 Resource Guide to Airport Performance Indicators

SQ C-29
Service Quality

Customer Satisfaction with Airport

Definition

Measures customer satisfaction with the airport, typically through survey information.

Data Sources

Multiple survey sources are available including the ACI Airport Service Quality Program administered by DKMA and the JDPowers Airport Satisfaction Index Study. Airports may also customize and use their own surveys of passengers at the airport in a variety of areas (e.g., concessions, condition of facilities, wayfinding), also track complaints and customer comment cards.

Applicability

All airports, although ACI-ASQ and JDPowers surveys are limited to commercial service airports.

Comments

Although difficult to measure, customer satisfaction with the airport is an increasingly important core indicator. Individual airport surveys are useful in comparing airport trend over time, and highlighting particular issues. Huge multi-airport surveys such as ACI-ASQ and JDPowers are useful for benchmarking with other airports, but may be expensive. Understanding not just the level of customer satisfaction but what drives customer satisfaction enables airport executives to deploy resources most effectively, including taking steps to influence other entities, such as airlines and government agencies, whose performance affects customer satisfaction with the airport.

Very important for self-benchmarking, also for peer benchmarking for those large/medium hub airports covered by multi-airport surveys.

Copyright National Academy of Sciences. All rights reserved.

SQ K-1
Service Quality

Airport Cleanliness – Passenger Perception

Definition

Measures passenger perception of airport cleanliness, including restrooms and other facilities.

Data Sources

Airport survey records or results of participating in industry surveys such as ACI-ASQ.

Applicability

All airports

Comments

Measures passenger perception of airport cleanliness, which is an important driver in the overall passenger satisfaction level. Useful for self-benchmarking, also peer benchmarking to the extent similar survey instruments and techniques are used.

Copyright National Academy of Sciences. All rights reserved.

232 Resource Guide to Airport Performance Indicators

SQ K-2
Service Quality

Airport Courtesy – Passenger Perception

Definition

Passenger perception of courtesy of airport employees and other staff.

Data Sources

Airport survey records or results of participating in industry surveys such as ACI-ASQ.

Applicability

All airports

Comments

Measures passenger perception of courtesy of airport staff, TSA, other police and security, and Customs and Border Patrol. Studies show passenger perception of courtesy is very important in forming their overall impression of the airport. Courtesy of concessionaire and airline personnel is also important and can be measured using survey instruments. Airport has limited or no control over some of these interactions. Useful for self-benchmarking, also peer benchmarking to the extent similar survey instruments and techniques are used.

Copyright National Academy of Sciences. All rights reserved.

SQ K-3
Service Quality

Arrival Delay per Flight

Definition

Average arrival delay per flight – measured at average and peak times.

Data Sources

A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes.

Applicability

All commercial service airports

Comments

Multiple delay measures are used. From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late. Very important for self-benchmarking and peer benchmarking, as poor performance signals airfield capacity or ATC issues.

Copyright National Academy of Sciences. All rights reserved.

SQ K-4
Service Quality

Baggage Claim – Passenger Perception

Definition

Passenger perception of baggage claim service.

Data Sources

Airport survey records or results of participating in industry surveys such as ACI-ASQ.

Applicability

All commercial service airports

Comments

Measures passenger perception of baggage claim service, which is normally an airline function beyond the control of the airport. Often, however, passengers believe the airport is at least partially responsible for bag claim issues. Passenger perception may reflect actual bag claim wait times, as well as information (or the lack thereof) provided as to bag delivery status during the waiting period. Airport design and bag claim facilities and amenities also influence passenger perception of bag claim service. Bag delivery results may also vary depending on the airline providing the service.

Useful for self-benchmarking, also peer benchmarking to the extent similar survey instruments and techniques are used.

Copyright National Academy of Sciences. All rights reserved.

SQ K-5
Service Quality

Departure Delay per Flight

Definition

Average departure delay per flight – measured at average and peak times. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late.

Data Sources

A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes.

Applicability

All airports with passenger flights

Comments

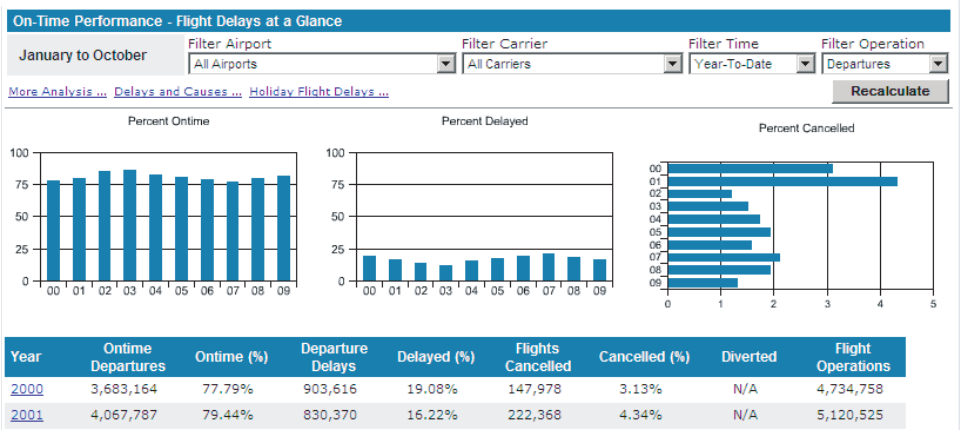
Multiple delay measures are used. From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be more relevant.

Departure delays may be a function of limited airport capacity, limited ATC capacity, airline scheduling practices, airline operational issues, adverse weather and other factors. Measurement during peaks is typically more meaningful than at other times. Degree of airport control is likely to be very limited, though important in those instances, e.g., snow removal from runways and taxiways.

Very important for self-benchmarking and peer benchmarking, as poor performance signals airfield capacity or ATC issues.

Example

Screenshot of Bureau of Transportation Statistics Website



Year	Ontime Departures	Ontime (%)	Departure Delays	Delayed (%)	Flights Cancelled	Cancelled (%)	Diverted	Flight Operations
2000	3,683,164	77.79%	903,616	19.08%	147,978	3.13%	N/A	4,734,758
2001	4,067,787	79.44%	830,370	16.22%	222,368	4.34%	N/A	5,120,525

Source: BTS website

Copyright National Academy of Sciences. All rights reserved.

SQ K-6
Service Quality

Ease of Connection – Passenger Perception

Definition

Passenger perception of ease of connection at the airport.

Data Sources

Airport survey records or results of participating in industry surveys such as ACI-ASQ.

Applicability

Airports with a substantial number of connecting passengers.

Comments

Measures passenger perception of ease of connection, which may reflect distance between gates and terminals; ease or difficulty of changing terminals; TSA, Customs and Border Patrol processing; crowd density particularly at peak times; and other factors. Passenger experiences and expectations are likely to be different at major international airports than at domestic airports. Useful for self-benchmarking, also peer benchmarking to the extent similar survey instruments and techniques are used.

Copyright National Academy of Sciences. All rights reserved.

SQ K-7
Service Quality

Percent of Arriving Flights Delayed

Definition

Percent of arriving flights delayed by 15 or more minutes.

Data Sources

A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes.

Applicability

All commercial service airports

Comments

Multiple delay measures are used. From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late. Very important for self-benchmarking and peer benchmarking, as poor performance may signal airfield capacity or ATC issues.

Example

On-Time Arrival Performance Statistics as Shown on BTS Website

Rank	Jan 1 - Jan 31, 2010	%
1	Seattle, WA (SEA)	86.40
2	Portland, OR (PDX)	85.72
3	Phoenix, AZ (PHX)	84.25
4	Denver, CO (DEN)	84.09
5	Salt Lake City, UT (SLC)	83.53
6	Las Vegas, NV (LAS)	83.21
7	Houston, TX (IAH)	82.87
8	San Diego, CA (SAN)	82.19
9	Los Angeles, CA (LAX)	81.57
10	Minneapolis/St. Paul, MN (MSP)	81.35

Source: BTS website

Copyright National Academy of Sciences. All rights reserved.

SQ K-8
Service Quality

Percent of Departing Flights Delayed

Definition

Percent of departing flights delayed by 15 or more minutes.

Data Sources

A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes.

Applicability

All commercial service airports

Comments

Multiple delay measures are used. From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late. Very important for self-benchmarking and peer benchmarking, as a poor performance may signal airfield capacity or ATC issues.

Copyright National Academy of Sciences. All rights reserved.

SQ K-9
Service Quality

Wait Times at Major Processing Sites Other than Security Checkpoints

Definition

Average wait times in minutes during peak periods at major processing sites other than security check points — primarily used for Customs and Border Patrol wait times, can also measure wait times at airline processing sites such as ticket counters.

Data Sources

Airport measurements of wait times.

Applicability

Airports with significant queues other than security

Comments

Important to measure during peaks, as average wait times throughout the day will not produce a meaningful measure. Passenger experiences and expectations are likely to be different at major international airports than at smaller airports. Useful for self-benchmarking. Useful for peer benchmarking to the extend data is available.

Copyright National Academy of Sciences. All rights reserved.

240 Resource Guide to Airport Performance Indicators

SQ K-10
Service Quality

Wait Times at Security Checkpoints

Definition

Wait times at security checkpoints — measured at average and at peak times.

Data Sources

Airport surveys and TSA information

Applicability

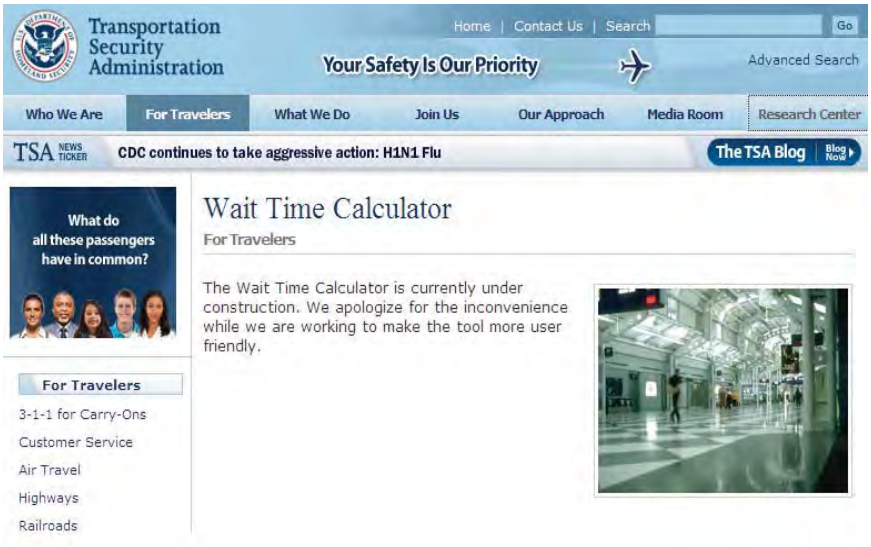
All airports with passenger flights

Comments

Availability of real time data may help identify and correct problems. Comparative information may highlight need for additional staffing. The TSA public "Wait Time" web site is under construction. However, airports still have access to TSA wait time data at their own airport. Airports also frequently conduct their own studies of wait times. Although wait times at security checkpoints are a function of TSA staffing levels, passengers tend to hold airports responsible, including wait times in their evaluation of airports.

Important for self-benchmarking and for peer benchmarking, as passengers frequently compare wait times at different airports.

Example



Source: http://www.tsa.gov/travelers/waittime.shtm

Copyright National Academy of Sciences. All rights reserved.

SQ K-11
Service Quality

Wayfinding – Passenger Perception

Definition

Passenger perception of ease of wayfinding at the airport.

Data Sources

Airport survey records or results of participating in industry surveys such as ACI-ASQ.

Applicability

Large and some medium airports

Comments

Measures passenger perception of wayfinding, which reflects effectiveness of signage, as well as airport layout and building design issues. For example, a long linear concourse with a clear line of sight may present fewer wayfinding issues than curved concourse, regardless of signage. Useful for self-benchmarking, also peer benchmarking to the extent similar survey instruments and techniques are used.

Copyright National Academy of Sciences. All rights reserved.

Service Quality – Other APIs

No.	Indicator Name	Definition
SQ O-1	Access to City Center	Qualitative measure of access from airport to city center via various modes of transportation
SQ O-2	Access to Ground Transportation (Arrivals)	Qualitative measure of access to transportation from the terminal for arriving passengers
SQ O-3	Access to Terminals (Departures)	Qualitative measure of access to terminals for passengers arriving at the terminal, airport employees working at or transiting the terminal
SQ O-4	Actual Flight Connecting Times	Actual time for transitioning from one flight to another for the particular airport
SQ O-5	ADA Requirements Met During Year Compared with Total Number of ADA Requirements (%)	Percentage of ADA requirements met during year compared with total number of ADA requirements
SQ O-6	Aesthetic Appeal	Qualitative measure of aesthetic appeal of airport to passengers and visitors
SQ O-7	Airport Accessibility Rating	How passengers rate the ease of arriving to or leaving a terminal including public transportation, parking facilities, rental cars, wayfinding to and on major roadways in the vicinity
SQ O-8	Airport Employees Trips to Work via Public Transportation	Measures employee(airport and tenant) trips to the airport as a result of public transportation, and reduction from previous period
SQ O-9	Availability of Children's Amenities	Measures space dedicated to children, play areas, etc.
SQ O-10	Average Processing Time for Short- and Long-Term Parking	Average processing time for short- and long-term parking
SQ O-11	Average Time from Long-Term Parking to the Passenger Terminal	Average time from long-term parking to the passenger terminal
SQ O-12	Business Services	Availability and quality of business services to passengers
SQ O-13	Check-In Rating Including Bag Check	This factor is based on how passengers rate the ease of finding check-in locations and navigating the check-in process
SQ O-14	Complaints Regarding Signage Maintained by Airport	Complaints regarding signage maintained by airport
SQ O-15	Complaints Regarding Signage Maintained by Airport Tenants	Complaints regarding signage maintained by airport tenants
SQ O-16	Concessionaires and Airlines Participating in Airport-wide Customer Satisfaction Programs – Number of	Number of concessionaires and airlines participating in airport-wide customer satisfaction programs
SQ O-17	Curb-to-Gate Distance	Curb to gate distance
SQ O-18	Curb-to-Gate Time	Curb to gate transit time - enplaning passenger undergoing processing
SQ O-19	Customer Complaints, Number of by Type	A measure of customer concerns and issues
SQ O-20	Customer Satisfaction Indicators	A measure of the public's opinion of the airport
SQ O-21	Delay Curve	Measures airfield delays due to congestion of airline flights at peak activity periods
SQ O-22	Disabled Access	Ease of access for disabled passengers and visitors
SQ O-23	Driver Courtesy – Airport Passenger Vehicles	Provides a rating of driver courtesy, either from a sampling of passenger opinion
SQ O-24	Employees Participating in a Ride-Share or Other Employee Trip-Reduction Program – Number of	Airport employee trips to the airport as a result of ride-share or other employee trip-reduction programs

Copyright National Academy of Sciences. All rights reserved.

No.	Indicator Name	Definition
SQ O-25	Employees Using Public Transport (%)	Percentage of employees using public transport
SQ O-26	Flight Ground Delays	Delays attributable to taxiway, ramp and gate area aircraft congestion
SQ O-27	Flights Arriving More than 30 Minutes Late (%)	Percentage of flights arriving more than 30 minutes late
SQ O-28	Flights Departing More than 30 Minutes Late (%)	Percentage of flights departing more than 30 minutes late
SQ O-29	Frequency of Ground Transportation Service	Frequency of ground transportation service
SQ O-30	Gate Availability	Percentage of passengers who are served at gates versus hard stands
SQ O-31	Inter-Terminal Transportation – Wait Times at Peak Periods	Inter-terminal transportation – wait times at peak periods
SQ O-32	Minimum Flight Connecting Times	Minimum published times for the particular airport
SQ O-33	Passenger Assistance Services	Availability of passenger assistance services
SQ O-34	Passenger Perception of Cleanliness	Passenger perception of cleanliness of various airport facilities
SQ O-35	Passenger Perception of Departure Lounge Seat Availability	Passenger perception of lounge seating availability based on response to survey
SQ O-36	Passenger Wait Times at Major Processing Sites	Passenger wait times at major processing sites
SQ O-37	Security Checkpoint Rating	Passenger rating of the time required for the security screening process with and without queuing time
SQ O-38	Surveys – Number and Frequency of	Number and frequency of customers surveyed, surveys conducted, areas surveyed
SQ O-39	Taxi Availability – Numbers	Taxi availability – number of taxis available
SQ O-40	Taxi Availability – Wait Times	Taxi availability – wait times
SQ O-41	Terminal Area per Enplaned Passenger	Terminal space in square feet or square meters per passenger. A measure relating to passenger convenience and comfort; measuring specific areas (e.g., holdroom areas) more helpful.
SQ O-42	Terminal Facilities Overall Rating	Terminal facilities overall rating
SQ O-43	Time to Cure Negative Comments or Complaints	Time to cure negative comments or complaints
SQ O-44	Time to Respond to Negative Comment Cards or Complaints	Time to respond to negative comment cards or complaints
SQ O-45	Transit System In-Service Percentage	Percentage of time on-airport transit system is operating

Copyright National Academy of Sciences. All rights reserved.

Terminal Operations (TO)

Airport performance measures for Terminal Operations focus on the intensity and efficiency of, and satisfaction with, terminal operations.

Key Indicators

Enplanements per Gate ..... TO K-1
Enplanements per Terminal Square Foot ..... TO K-2
Gate Utilization ..... TO K-3

Other Related Core and Key Indicators

Energy Management

Utilities/Energy Cost per Square Foot of Terminal Building ..... EN K-8

Environmental

LEED Building Projects – % New Building Projects Being Built to LEED Standards ..... EV K-3

Maintenance

Custodial/Janitorial Cost per Square Foot of Terminal ..... MN K-2
Escalators, Moving Walkways, and Elevators – Percent of Time in Service ..... MN K-3
Jet Bridge Maintenance Cost ..... MN K-4
Maintenance Cost per Square Foot of Terminal ..... MN K-5

Service Quality

Airport Cleanliness – Passenger Perception ..... SQ K-1
Airport Courtesy – Passenger Perception ..... SQ K-2
Baggage Claim – Passenger Perception ..... SQ K-4
Ease of Connection – Passenger Perception ..... SQ K-6
Wait Times at Major Processing Sites Other than Security Checkpoints ..... SQ K-9
Wait Times at Security Checkpoints ..... SQ K-10
Wayfinding – Passenger Perception ..... SQ K-11

See Other Indicators in ..... ***Energy Management, Environmental, Maintenance, Service Quality***

Comments

- Terminal Operations encompasses a wide range of activities that occur within the terminal. Some of these activities are measured by passenger flow rates at check-in desks or security points, others by customer satisfaction levels, and others e.g., moving walkways, by reliability levels.

Copyright National Academy of Sciences. All rights reserved.

TO K-1
Terminal Operations

Enplanements per Gate

Definition

Annual enplanements divided by number of gates.

Data Sources

Airport records

Applicability

All commercial service airports

Comments

Provides a measure of the intensity of gate usage and, at a more detailed level, is also used as a service level indicator. As the number of enplanements per gate increases, airports must consider whether to add more gates or to restrict carriers from adding service except during non-peak or unused time slots. Further analysis of gate utilization during the schedule peak is also required. As with other gate-based measures, gate utilization requires an understanding of gate capacity by aircraft type.

The arrangement under which carriers use gates varies from airport to airport, often even gate to gate within a particular airport. Some gates are leased by the carrier for its exclusive use or preferential use; others are designated common-use. Accommodation and recapture provisions are often employed by airports.

This indicator is useful for self-benchmarking and peer benchmarking. Gate utilization by low-cost carriers is often higher than that of legacy network carriers.

Copyright National Academy of Sciences. All rights reserved.

TO K-2
Terminal Operations

Enplanements per Terminal Square Foot

Definition

Annual enplanements divided by terminal square feet.

Data Sources

Airport records

Applicability

All commercial service airports

Comments

Provides a measure of the intensity of terminal usage and, at a more detailed level, is also used as a service level indicator. IATA Level-of-Service standards set a minimum amount of space to be used for major terminal areas in order to be designated as meeting different service levels, ranging from A to F. Level of service A, which represents an excellent level of service, is considered to provide sufficient terminal space to permit free flows, with no terminal delays, and excellent comfort. Level C, which represents a good level of service, is considered to provide sufficient terminal space to permit stable flows, with acceptable terminal delays, and good comfort.

Useful for self-benchmarking and for peer benchmarking. Care must be taken to consider peaking profiles for the airport itself and differences in peaking profiles among airports being compared. For example, an airport with only two major international banks of flights per day may have relatively few enplanements per terminal square foot on average, but very high enplanements per square foot during those two banks.

Copyright National Academy of Sciences. All rights reserved.

TO K-3
Terminal Operations

Gate Utilization

Definition

Average number of flight departures per gate per day, typically measured separately during weekdays and the weekend.

Data Sources

Airport records

Applicability

All commercial service airports

Comments

As the number of departures per gate increases, airports must consider whether to add more gates or to restrict carriers from adding service except during non-peak or unused time slots. Further analysis of gate utilization during the schedule peak is also required. As with other gate-based measures, gate utilization requires an understanding of gate capacity by aircraft type.

This indicator is useful for self-benchmarking and peer benchmarking. Gate utilization by low-cost carriers is often higher than by legacy network carriers.

Copyright National Academy of Sciences. All rights reserved.

Terminal Operations – Other APIs

No.	Indicator Name	Definition
TO O-1	Aircraft Turn Times	Average time to deplane, service and enplane aircraft
TO O-2	Average Time to Resolve Terminal Work Order Requests	Average time to resolve terminal work order requests
TO O-3	Average Transaction Time – International Passenger Processing	Average transaction time – international passenger processing
TO O-4	Number of Flights per Gate by Individual Carrier	Number of flights per gate by individual carrier – per day
TO O-5	Number of Flights per Gate per Day	Number of flights per gate per day – all carriers
TO O-6	Gates – Number of	Number of gates usable by aircraft of any size
TO O-7	Usable Gates – Number of	Number of gates usable by aircraft in common use at airport
TO O-8	Usable Gates in Service – Number	Number of usable gates being utilized during a specified period
TO O-9	Operations per Gate	Airline operations (a landing or a takeoff) per gate
TO O-10	Usable Gates in Service (%)	Percentage of usable gates in service
TO O-11	Terminal Work Order Requests Resolved to Total Number Received (%)	Percentage of terminal work order requests resolved to total number received
TO O-12	Number of Jet Bridges on Airport	Number of jet bridges on the airport

Copyright National Academy of Sciences. All rights reserved.

SECTION 3

Additional Resources

Section 3 contains a glossary of terms, a bibliography, and an alphabetical index of APIs.

Glossary of Terms

This glossary defines most of the significant terms used in the Core and Key APIs.

Airside, Airside Facilities, Airfield. Airport-operated facilities located on and supporting the airport's aircraft operating area. Includes runways, taxiways, landing strips, runway protection zones, clearways, airport-owned runway and taxiway instrumentation. Also includes structures located thereon. Usually defined as a cost center for landing fee ratemaking purposes in the Airport Use/Operating Agreement. FAA equipment and facilities not included. Aircraft parking positions usually not included, aircraft parking fee rate separate from landing fee rate. Deicing facilities usually not included; their cost recovered outside the landing fee. (Source: ACRP Project 01-09 Research Team based on FAA Form 127.)

ARFF. Aircraft Rescue and Fire Fighting (ARFF) denotes services used to perform fire fighting and rescue operations at airports, subject to Federal Aviation Regulations Part 139 (14 CFR) dealing with air carrier airport safety and certification. ARFF functions may include capabilities for responding to issues in non-airfield structures (e.g., terminals, office buildings), also mutual aid to neighboring communities, but always retaining assets required for Part 139 requirements. (Source: ACRP Project 01-09 Research Team based on ACI-NA Airport Benchmarking Survey.)

Assets, Net. Capital assets net of related debt, plus unrestricted assets, plus restricted assets (restricted for debt service, new and replacement capital, and other). Net assets will be shown in the airport's financial statements as of the end of the fiscal year being reported. If the airport is part of a system, it should allocate net assets between the airport and other reporting entities. (Source: ACI-NA Airport Benchmarking Survey.)

Benefits, Employee. For employees working directly for the airport, includes health and life insurance, savings, pensions and retirement, tuition credit, wellness/fitness programs. Does not include contracted employees. (Source: ACI-NA Airport Benchmarking Survey.)

Capital Expenditures. Total expenditures on airport capital projects during the fiscal year being reported even if the facility or improvement did not become operational during the fiscal year. (Source: ACI-NA Airport Benchmarking Survey.)

Carbon Footprint. Carbon footprint is the overall amount of carbon dioxide and other greenhouse gas (GHG) emissions caused by the airport and its operation, including airlines and other tenants and users, total and by identifiable source. (Source: European Commission: CARBON FOOTPRINT—What It Is and How to Measure It.)

Copyright National Academy of Sciences. All rights reserved.

Cargo Tons. Unit of measurement for cargo (freight) carried in the bellies of passenger ("combination") aircraft or by all-cargo aircraft. Two types are in common aviation use: The Short Ton (2,000 lb) prevalent in the United States, and the Metric Ton or "Tonne" (1000 kg or 2204.6 lb) used in countries subscribing to the metric system. (Source: ACI-NA Cargo Benchmarking Survey.)

Cash and Investments (Restricted and Unrestricted). The total amount of restricted and unrestricted cash and investments as of the end of the fiscal year. If the airport is a part of a system, then the airport should make its best effort to allocate cash and investments between the airport and other reporting entities. (Source: ACI-NA Airport Benchmarking Survey.)

Costs, Airline. Airline payments to the airport for use of airfield (landing fees, ramp/apron fees) and terminal space (space rentals net of any credits and reimbursements, gate charges). This value is the same as Total Passenger Airline Revenue to the Airport (see below). Includes payments for aircraft parking positions (e.g., hard stands, tie-downs). Includes federal inspection fees and security reimbursements paid by the airline. Does not include ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars). Does not include airline self-funded construction (e.g., build-out of terminal space). Does not include other costs incurred by the airline to operate at the airport (e.g., fuel, maintenance, personnel, services, supplies and equipment.) (Source: ACRP Project 01-09 Research Team based on ACI-NA Airport Benchmarking Survey.)

Costs, Contract Services. Payments to outside contractors for services provided to the airport. Such costs may include consulting, legal, accounting, auditing, security, fire fighting, engineering, training, lobbying, maintenance, janitorial services, architectural fees, and financial services. When part of a capital project (e.g., architectural and engineering services, bond financing services), they are generally included in capital cost and amortized over the life of the borrowing instrument. (Source: ACRP Project 01-09 Research Team based on FAA Form 127 and ACI-NA Benchmarking Survey.)

Costs, Direct Operating. Payments for goods and services directly measurable without resorting to allocation formulae. Not in general use. (Source: ACRP Project 01-09 Research Team.)

Costs, Indirect Operating. Administrative overhead expenses including expenses allocated by formula to "using" departments. Formulae used because difficult or inconvenient to measure directly. Not in general use. (Source: ACRP Project 01-09 Research Team.)

Costs, Non-Operating. Expenses for activities not relating to the core operations of the airport. Common airport Non-Operating Costs include interest charges and other borrowing costs; expenses relating to employee benefits such as pension contributions; capital distributions and payments (e.g., to governing bodies); extraordinary losses; and taxes. (Source: ACI-NA Airport Benchmarking Survey.)

Costs, Operating. Expenses incurred in the normal operation of the airport. These include administrative expenses. (Source: ACI-NA Benchmarking Survey.)

Costs, Personnel. The total of salaries plus wages plus employee benefits. (Source: ACI-NA Benchmarking Survey.)

Costs, Total Airport. The total of all airport costs: operating costs plus non-operating costs.

Costs, Utilities, and Communications. The cost of communications services and utilities used in the course of operating the airport, including telephones, electricity, heating and air conditioning, and water. (Source: ACI-NA Benchmarking Survey and FAA Form 127.)

Debt, General Airport Revenue Bond (GARB). Bond debt secured by general airport revenues. (Source: ACRP Project 01-09 Research Team.)

Copyright National Academy of Sciences. All rights reserved.

252 Resource Guide to Airport Performance Indicators

Debt, General Obligation. Bond debt secured by general tax dollars (beyond airport revenues). Once common, now typically issued by cities with smaller airports (also known as tax supported debt). (Source: ACRP Project 01-09 Research Team.)

Debt, Passenger Facility Charge (PFC). Stand-alone debt secured solely by (and to be repaid exclusively from) PFC revenues. (Source: ACI-NA Benchmarking Survey.)

Debt Service. Principal plus interest paid or to be paid over the life of a particular debt instrument, or within a particular reporting period. Net debt service is debt service less offsets such as PFCs and capitalized interest. (Source: ACI-NA Benchmarking Survey.)

Debt Service Coverage Ratio. Net revenues as defined in airport bond ordinance divided by principal and interest requirements for the current fiscal year. Expressed as a ratio, typically a minimum of 125% but higher at some airports. The obligation to have a minimum Debt Service Coverage Ratio derives from a provision in the bond ordinance and made part of the contract with bondholders through inclusion in the bond official statement. The required minimum coverage ratio is typically restated in the Airport Use/Operating Agreement. (Source: Moody's Global Infrastructure Finance and ACRP Project 01-09 Research Team.)

Debt, Special Facility. Debt typically issued through a property development corporation and being repaid by an airline or tenant for improvements/facilities through special lease payments, rather than the airport's normal fee structure. This may be airline related or non-airline related. It excludes off-balance sheet debt. (Source: ACI-NA Benchmarking Survey.)

Depreciation. If the airport depreciates its assets, the depreciation for the reporting fiscal year. (Source: ACI-NA Benchmarking Survey.)

Enplaned Passenger (Enplanement). See Passenger, Enplaned (Enplanement) below.

Fees and Charges, Airline: Airline Costs (see above) considered as fees and charges paid by the airlines. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey and FAA Part 127.)

Fees, General Aviation (GA) Landing. Landing fees paid for landings of GA aircraft. Excludes all other GA fees. (Source: ACI-NA Benchmarking Survey and FAA Part 127.)

Fees, Fuel Flowage. Fees paid to the airport directly or through a fixed base operator (FBO) or other third-party fueler, for use of fueling facilities (tank farms, pipelines, into-plane delivery systems including hydrant systems). Expressed on a per-gallon basis. Does not include the cost of fuel, which is typically owned by the airlines. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey and FAA Part 127.)

Fees, Landing. Fees charged to aircraft owners and operators for the use of runways, taxiways, landing strips, runway protection zones, and clearways. Does not include fees for parking aircraft. (Source: ACI-NA Benchmarking Survey and FAA Form 127.)

Fees, Terminal Area Apron and Tie Down. Fees charged for the parking of passenger aircraft on airport property. (Source: ACI-NA Benchmarking Survey and FAA Form 127.)

Fees, Terminal Area Passenger Airline. Fees charged for aeronautical use of the terminal facilities and ground space for the purpose of moving passengers and their baggage (paid by the airlines to the airport). Includes charges for aeronautical use of terminal buildings as office space, check-in and ticket counters, hold rooms, passenger baggage claim and staging areas, and other operational and maintenance facilities necessary for the air transportation of passengers. Includes all terminal facilities, utilities, ITS, and equipment charges except those specifically enumerated in the ACI-NA Benchmarking Survey under Terminal Area Fees. Does not include

Copyright National Academy of Sciences. All rights reserved.

cargo and hangar rentals. See Terminal Rental Rate (below). (Source: ACI-NA Benchmarking Survey.)

Full-Time Equivalents (FTEs). The number of full-time employees that could have been employed if the hours worked by part-time employees had been worked by full-time employees. For example, if a part-time employee works 20 hours a week, he/she should be counted as 0.5 FTEs. Usually measured at the end of a reporting period. (Source: ACI-NA Benchmarking Survey.)

General and Administrative Expenses. Miscellaneous general and administrative expenses (e.g., training, travel, etc.). (Source: ACI-NA Benchmarking Survey.)

Gate, Airport for Aircraft Use. An aircraft parking position on the terminal ramp (apron) usually connected to the terminal by a loading bridge. Gates are typically defined to include positions large enough for narrowbody or larger aircraft; smaller positions used for regional jets or turboprops are typically counted separately. (Source: ACRP Project 01-09 Research Team.)

Grant Receipts. The amount of Airport Improvement Program (AIP) grant and other grant payments received in the year. (Source: ACI-NA Benchmarking Survey.)

Insurance, Claims, and Settlements. The costs of insurance coverage and/or claims and settlements paid by the airport. (Source: ACI-NA Benchmarking Survey, FAA Part 127.)

Interest Expenses. Reporting period interest expenses. (Source: ACI-NA Benchmarking Survey, FAA Form 127.)

Interest Income. The interest income received from restricted and non-restricted investments. (Source: ACI-NA Benchmarking Survey, FAA Form 127.)

Landside, Landside Facilities. Airport-operated facilities and equipment other than those on the aircraft operating area of an airport. Includes terminal buildings and roadways. (Source: ACRP Project 01-09 Research Team.)

Landed (Take Off) Weight, Total. The total amounts of weight of aircraft landings or (where applicable) take-offs at the airport for domestic, international, and cargo carriers (in millions of pounds). Does not include landed or take-off weights for GA and military aircraft. Aircraft weights are generally calculated based on maximum certificated weights. (Source: ACI-NA Benchmarking Survey, FAA Part 127.)

Landing Fee, Average Rate. The post-settlement landing (or, where applicable, take-off) fee per 1,000 lb for airlines signatory to the airport use/operating agreement. Except where set by regulation (ordinance) or as a result of direct negotiation, the landing fee rate results from a formula in the airport use/operating agreement, designed to recover a defined array of costs in a total airport residual, cost center residual, compensatory, or hybrid arrangement. The Landing Fee Rate for non-signatory airlines is usually set at a multiple of the signatory airline landing fee rate, such as 125%. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey.)

Operation, Aircraft. An aircraft takeoff or landing at the airport. (Source: ACI-NA Benchmarking Survey.)

Operations, Annual Aircraft. Total of aircraft operations (take-offs plus landings) at the airport for the fiscal year being reported. (Source: ACI-NA Benchmarking Survey.)

Passenger Facility Charges/Airport. The Passenger Facility Charges (Airport Improvement Fee for Canadian Airports) received during the year.

Passenger, Enplaned (Enplanement). A passenger who boards an aircraft at the airport. Includes a passenger who deplanes and reboards to continue his/her air journey from the airport. Includes domestic and international enplanements. Does not include enplanements from

Copyright National Academy of Sciences. All rights reserved.

GA, military, or cargo aircraft. Note that some definitions limit enplanements to revenue passengers; see, e.g., FAA: Enplanement and All Cargo Activity. (Source: ICAO Civil Aviation Terms and Descriptions.)

Passengers, Origin and Destination (O & D). Total of passengers whose flight begins or ends at the airport, in contrast to passengers who change planes at the airport to go to another destination. (Source: ACRP Project 01-09 Research Team.)

Passengers, Total. The total number of people enplaning and deplaning passengers. This number is normally equal to two times the number of enplanements assuming that everyone who boards an airplane deboards the airplane. These amounts should not include any passengers from GA, military, or cargo aircraft. (Source: ACI-NA Benchmarking Survey, ICAO Civil Aviation Terms and Descriptions.)

Reliever Airport. Airport(s) designated by the FAA to relieve congestion at commercial service airports and to provide improved GA access to the overall community. (Source: FAA NPIAS.)

Revenues, Aeronautical Operating. Aeronautical revenues (income) to the airport from aeronautical uses by airlines, aircraft owners, and fixed base operators (FBOs). Aeronautical use is any activity that involves, makes possible, is required for the safety of, or is otherwise directly related to the operation of aircraft. Aeronautical use includes services provided by air carriers related directly and substantially to the movement of passengers, baggage, mail, and cargo in the airport. Individuals and businesses, when engaged in the operation of aircraft or flight support, are aeronautical users. (Source: ACI-NA Benchmarking Survey, FAA Form 127.)

Revenues, Terminal Concession. Revenues (income) to the airport from sales at airport concessions located inside the terminals. Includes minimum annual guarantee payments and percentage rent, excludes utilities and storage. Conforms to FAA Form 127 and ACI-NA Benchmarking Survey, which divide concessions revenue into terminal, rental car, public parking and ground transportation, and other. Does not include rental car revenues even though some rental car facilities (e.g., check-in counters) are often located inside terminals. Does not include parking or ground transportation revenues even though some of such facilities may be inside or associated with the terminal. This is a net revenue concept; for gross revenues see Sales, Concession Gross (below). (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey.)

Revenues, Terminal Food and Beverage. Revenues (income) to the airport from food and beverage concessionaires located inside the terminals. (Source: ACI-NA Benchmarking Survey and FAA Form 127.)

Revenues, Hangar and Cargo Rental. Revenues (income) to the airport from the ground lease use of airport facilities and land for cargo operations and the hangaring of aircraft including maintenance activities. Does not include revenue from a cargo or hangar facility leased for non-aeronautical purposes. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey.)

Revenues, Non-Aeronautical Operating. Revenues (income) to the airport not derived from the aeronautical use of the airport. Includes revenues from land rental and non-terminal facilities; terminal food, beverages, and retail; rental cars; public and employee parking; hotel and ground transportation; and utilities sale/resale. (Source: ACI-NA Benchmarking Survey, FAA Form 127.)

Revenues, Non-Airline. Revenues to the airport from sources other than the airlines. Can include, for example, aeronautical revenues from landing fees of business aircraft. (Source: ACRP Project 01-09 Research Team.)

Copyright National Academy of Sciences. All rights reserved.

Revenues, Non-Operating. Revenues (income) to the airport that are not derived from airport operations. Includes revenues from investment of financial assets (interest income), PFC charges, grant receipts, other capital contributions, and rental car customer facility charges. (Source: ACRP Project 01-09 Research Team based on FAA Part 127 and ACI-NA Benchmarking Survey.)

Revenues, Operating. Revenues (income) to the airport from airport operations of any type. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey.)

Revenues, Parking. Revenues (income) to the airport from on-airport parking operations and services (e.g., valet fees) and from off-airport parking operators. In addition, the ACI-NA and FAA Form 127 definition groups ground transportation revenues (taxis, limos, shuttles) with parking revenues. Reported revenues should be the airport's net after its costs. Includes revenues from public parking only. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey, FAA Part 127.)

Revenues, Rental Car. Revenues (income) to the airport from rental car operations inside and outside terminals. Reported revenues should include ground rentals, percentage rents (concession fee), and other miscellaneous charges, excluding customer facilities charges. FAA Form 127 and ACI-NA Benchmarking Survey track on-airport and off-airport rental car revenues separately. (Source: ACI-NA Benchmarking Survey, FAA Part 127.)

Revenue, Total Passenger Airline. Revenue (income) received by the airport from the passenger airlines for passenger air service. This value is the same as Airline Costs (above). Does not include ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars). Does not include airline self-funded construction (e.g., build-out of terminal space). Does not include other costs incurred by the airline to operate at the airport (e.g., fuel, maintenance, personnel, services, supplies, and equipment. (Source: ACRP Project 01-09 Research Team based on ACI-NA Benchmarking Survey.)

Security Reimbursements. Reimbursements from airlines for in-terminal security services provided. (Source: ACI-NA Benchmarking Survey.)

Security Reimbursements from TSA/Other Federal Government Organizations. Reimbursement to the airport from TSA or other federal government organizations for security costs.

Terminal Rental Rate, Average. Average rate charged by the airport for use of terminal space, per square foot of terminal space. This average terminal rental rate is typically divided or "spread" into a spectrum of rental rates for different types of space—ticket counter, office, holdroom, etc. Generally results from a formula in the Airport Use/Lease Agreement that recovers the airport's cost of providing space. See Fees, Terminal Area Passenger Airline (above).

Traffic Management. The function of managing traffic circulation and control on airport roadways, typically and most costly in terminal areas. The function can be performed by airport police, or at lower cost by non-sworn traffic officers under the supervision of airport police. (Source: ACRP Project 01-09 Research Team.)

Wayfinding. The ability of passengers to determine where they are in a facility; identify the organization of the facility; and find desired locations and services within the facility. Includes all forms of information available to orient and direct users, including signage, landmarks, landscaping, lighting, interior design, visual cues, maps and publications. (Source: Airport Signing and Graphics Manual.)

Work Load Unit (WLU). One WLU is equivalent to one passenger (departing or arriving) or 100 kg of cargo (inbound or outbound). (Source: U.K. C.A.A. 2002).

Copyright National Academy of Sciences. All rights reserved.

Bibliography

The primary goal of this ACRP Project 01-09 was to develop an extensive list of airport performance indicators (APIs), categorize them, and identify the Core indicators in each category, the data sources, and the issues. With its emphasis on practical issues, this project required more investigation than usual into what airport practitioners actually do in their jobs. To cover all the bases, however, the Research Team began with a thorough review of the academic and professional literature. A number of articles and other sources proved useful and are listed below.

ACRP Research Results Digest 3: Synthesis of Information Related to Airport Practices, Transportation Research Board of the National Academies, Washington, DC, 2007. http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rrd_003.pdf.

Airports Council International—North America (ACI-NA). *2008 Environmental Benchmarking Survey.* Washington, DC, 2008.

Airports Council International—North America (ACI-NA). *2009 ACI-NA Environmental Achievement Awards Rules,* Washington DC, 2009.

Airports Embracing Performance Measurement and Benchmarking. *World Airport Week,* September 5, 2007, Vol. 7, Issue 36, p. 1.

Air Traffic Safety Services, Federal Aviation Administration, U.S. DOT. *Runway Safety Report FY 2003–FY 2006.* Washington, DC, September 2007. http://www.faa.gov/runwaysafety/pdf/rireport06.pdf.

Air Transport Association of America, Inc. "Customers First 12-Point Customer Service Commitment." http://www.airlines.org/customerservice/passengers/Customers_First.htm.

"A New Approach: Performance Measurement and Benchmarking." *World Airport Week,* September 8, 1999, Vol. 6, Issue 36, p. 1.

Barros, C. P., and P.U.C. Dieke, "Performance Evaluation of Italian Airports: A Data Envelopment Analysis." *Journal of Air Transport Management,* Vol. 13, Issue 4, 2007, pp. 184–191.

Behn, R. D. "Why Measure Performance? Different Purposes Require Different Measures." *Public Administration Review,* Vol. 63, No. 5, September/October 2003, pp. 586–606.

Capacity Modeling and Analysis Group, Federal Aviation Administration, U.S. DOT. "Runway Delay Simulation Model (RDSIM)." Washington, DC. http://www.tc.faa.gov/acb300/rdsim.asp.

Cardoso, S. H., D. Maurino, and J. Fernandez. "Methodology to Estimate Individual and Overall Performance Indicators for Airport Safety Management Systems." *TRB 87th Annual Meeting Compendium of Papers DVD.* Transportation Research Board of the National Academies, Washington, DC, 2008.

City of Tallahassee Fiscal Year 2008 Approved Budget. "Aviation Performance Measures." p. 83. http://www.talgov.com/dma/budget/fy08/fy08budget.cfm.

Egan, J. *Accelerating Change: A Report by the Strategic Forum for Construction.* Strategic Forum for Construction, London, UK, July 1998.

Egan, J. *Rethinking Construction.* Construction Task Force Report. Department of Trade and Industry, London, UK, 1998.

Enoma, A., and S. Allen. "Developing Key Performance Indicators for Airport Safety and Security." *Facilities,* Vol. 25, No. 7, 2007, pp. 296–315.

Copyright National Academy of Sciences. All rights reserved.

"European Regional Airport Performance Data Published." *Commuter/Regional Airline News,* August 25, 2003, Vol. 21, Issue 33, p. 1.

FAA/OST Task Force. *Airport Business Practices and Their Impact on Airline Competition.* 1999. http://ostpxweb.dot.gov/aviation/Data/airportsbuspract.pdf.

Federal Aviation Administration. "Airport Noise and Land Use Information." Washington, DC. http://www.faa.gov/airports_airtraffic/airports/environmental/airport_noise/noise_exposure_maps/.

Federal Aviation Administration. "Environmental Tool Suite." http://www.faa.gov/about/office%5Forg/headquarters%5Foffices/aep/models/toolsfaq/.

Federal Aviation Administration. "Airport Financial Reports." Washington, DC. http://cats.airports.faa.gov//

Federal Aviation Administration. "Airport Master Records, Safety Data Program." Washington, DC. http://www.faa.gov/airports_airtraffic/airports/airport_safety/airportdata_5010/.

Federal Aviation Administration. "FAA Accident and Incident Data System (AIDS)." Washington, DC. http://www.asias.faa.gov/portal/page/portal/ASIAS_PAGES/ASIAS_DBS/AIDS_DB.

Federal Aviation Administration. *Form 5100-127* (Instructions for Completing.) http://www.faa.gov/forms/index.cfm/go/document.information/documentID/185626.

Federal Aviation Administration. *Presentation of the Changes to OPSNET Traffic Reporting Requirements—National Database Perspective.* April 2008.

Federal Aviation Administration. "Airport Safety Program." Washington, DC. http://www.faa.gov/airports_airtraffic/airports/airport_safety/.

Federal Aviation Administration. "Operational Network (OPSNET)." Washington, DC. http://aspm.faa.gov/.

Federal Aviation Administration. *National Plan of Integrated Airport Systems (NPIAS) (2007–2011).* Washington, DC, 2006. http://www.faa.gov/airports/planning_capacity/npias/reports/index.cfm?sect=2007.

Francis, G., J. Fry, and I. Humphreys. "International Survey of Performance Measurement in Airports." *Transportation Research Record: Journal of the Transportation Research Board, No. 1788.* Transportation Research Board of the National Academies, Washington, DC, 2002, pp. 101–106.

Fry, J., I. Humphreys, and G. Francis. "Benchmarking in Civil Aviation: Some Empirical Evidence." *Benchmarking: An International Journal,* Vol. 12, No. 2, 2005, pp.125–137.

Gillen, D., and A. Lall. *Developing Measures of Airport Productivity and Performance: An Application of Data Envelope Analysis.* Nanyang Business School, Singapore. (undated).

Gosling, G. D., and B. Maric. *Proof of Concept Study for a National Database of Air Passenger Survey Data.* Research Report for the National Center of Excellence for Aviation Operations Research. University of California at Berkeley, September 2005.

Gosling, G. D., and B. Maric. *Proof of Concept Study for a National Database of Air Passenger Survey Data,* Washington, DC, 2005. http://www.nextor.org/pubs/NR-2005-003.pdf.

Graham, A. "Airport Benchmarking: A Review of the Current Situation." *An International Journal.* University of Westminster, Vol. 12, Issue 2, 2005, pp. 99–111.

Graham, A. *Managing Airports: An International Perspective.* Butterworth-Heinemann. 2003.

Copyright National Academy of Sciences. All rights reserved.

Hagani et al. "Measuring and Determining Airport Productivity in Competitive Markets." *TRB 85th Annual Meeting Compendium of Papers CD-ROM,* Transportation Research Board of the National Academies, Washington, DC, 2006.

Hantziagelis, S., and B. McCabe. *Benchmarking Airport Reconstruction Projects.* Department of Civil Engineering, University of Toronto, Canada, September 2005.

Hensher, D. A., and K. J. Button. *Handbook of Transport Modeling.* (Handbooks in Transport, Volume 1). Elsevier Science B.V., New York, 2000.

Humphreys, I., and G. Francis. "Traditional Airport Performance Indicators: A Critical Perspective." *Transportation Research Record: Journal of the Transportation Research Board, No. 1703.* Transportation Research Board, National Research Council, Washington, DC, 2000, pp. 24–30.

Humphreys, I., G. Francis, and J. Fry. "Performance Measurement in Airports: A Critical International Comparison." *Public Works Management & Policy,* Vol. 6, Issue 4, 2002, pp. 264–275. J D Powers. *J D Power Airport Ratings,* 2007. http://www.jdpower.com/travel/ratings/airport-ratings.

Kincaid, I., and M. Tretheway. *Guidelines for Benchmarking Airports.* GARS Workshop: Hamburg Aviation Conference. Hamburg, Federal Republic of Germany, February 2006.

Kossmann, M. *Delivering Excellent Service Quality in Aviation: A Practical Guide for Internal and External Service Providers.* Ashgate Publishing, Burlington, VT, 2006.

Leigh Fisher Associates, Matthew A. Coogan, and MarketSense. *TCRP Report 62: Improving Public Transportation Access to Large Airports.* Transportation Research Board, National Research Council, Washington, DC, 2000. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_62-a.pdf.

Li et al. *Land Use Management and Airport Controls: Trends and Indicators of Airport Land Use.* The Partnership for AiR Transportation Noise and Emissions Reduction, Massachusetts Institute of Technology, Cambridge, MA, 2007. http://web.mit.edu/aeroastro/partner/projects/project6.html.

Lin, L. C., and C. H. Hong. "Operational Performance Evaluation of International Major Airports: An Application of Data Envelopment Analysis." *Journal of Air Transport Management,* Vol. 12, Issue 6, 2006, pp. 342–351.

Lurie, C. "How Do Airports Stack Up? Measuring Environmental Performance." *Airport Consulting,* Winter 2007/2008.

Mackenzie-Williams, P. "Aviation Benchmarking: Issues and Industry Insights from Benchmarking Results." *Benchmarking: An International Journal,* Vol. 12, No. 2, 2005, pp. 112–124.

Mann, P. "Many Upgrades Urged for Customer Service." *Aviation Week & Space Technology,* Feb. 19, 2001, Vol. 154, No. 8, pp. 44–45.

Martin, J. C. "A Benchmarking Analysis of Spanish Commercial Airports: A Comparison Between SMOP and DEA Ranking Methods." Department of Applied Economic Analysis, University of Las Palmas de Gran Canaria, Las Palmas, 2006.

Masucci, M. "Capital Program Planning Survey," Preliminary Results. Presentation to the ACI Ops/Tech Committee Meeting, March 2009.

Metropolitan Airports Commission Strategic Plan 2010–2015. http://www.metroairports.org/mac/docs/2010-2015%20Strategic%20Plan%20Final.pdf.

Moody's U.S. Public Finance, "U.S. Airport Medians for FY 2008." November 2009.

Moorman, R. "Massport Plan Faces Guaranteed Challenges." *Aviation Week & Space Technology,* Feb. 26, 2001, Vol. 154, No. 9, pp. 49–50.

Copyright National Academy of Sciences. All rights reserved.

Muia, M. J. *ACRP Synthesis 4: Counting Aircraft Operations at Non-Towered Airports.* Transportation Research Board of the National Academies, Washington, DC, 2007. http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_004.pdf.

Myers, R. H. "A Study of the Feasibility of Statistical Analysis of Airport Performance Simulation." NASA Contractor Report 3633. National Aeronautics and Space Administration, Scientific and Technical Information Branch, Washington, DC, 1982.

National Research Council (U.S.). "Issues, Problems, and Performance Measures in Airports and Airspace." Washington, DC, National Academy Press, 2000.

National Transportation Safety Board (NTSB). "NTSB Aviation Accident Database." http://www.ntsb.gov/ntsb/query.asp.

Office of Aviation Analysis, U.S. DOT. *Domestic Airline Fares Consumer Report, 2007.* http://ostpxweb.dot.gov/aviation/X-50 Role_files/consumerairfarereport.htm.

Office of Aviation Analysis, U.S. DOT. *Domestic Aviation Competition.* http://ostpxweb.dot.gov/aviation/X-50 Role_files/domesticcompetition.htm.

Office of Aviation Analysis, U.S. DOT. *Special Feature: Fare Premiums by Airport.* 2000. http://ostpxweb.dot.gov/aviation/domestic-competition/sf004.pdf.

Office of Aviation Enforcement and Proceedings, U.S. DOT. *Air Travel Consumer Report.* http://airconsumer.ost.dot.gov/reports/.

Office of the Assistant Secretary for Aviation and International Affairs, U.S. DOT. *Dominated Hub Fares.* 2001. http://ostpxweb.dot.gov/aviation/Data/dominatedhubfares.pdf.

Oregon Department of Aviation. "Annual Performance Progress Report FY 2003 and 2004." http://www.aviation.state.or.us/Aviation/performance.shtml.

Oum, T. H., Y. Chunyan, "A Comparative Analysis of Productivity Performance of the World's Major Airports. Crossing Borders: Travel, Trade, Security and Communication (Traverser les frontieres: voyage, commerce, securite et communication)." *Canadian Transportation Research Forum, Proceedings of the 38th Annual Conference,* 2003, pp. 106–120.

Pathomsiri, S. "Assessment of Airport Productivity: Nonparametric Directional Output Distance Function Approach and Its Robustness." *Transportation Research Record: Journal of the Transportation Research Board, No. 2007,* Washington, DC, 2007, pp. 28–36.

Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS), and U.S. DOT. "Airline On-Time Statistics and Delay Causes." http://www.transtats.bts.gov/OT_Delay/OT_DelayCause1.asp.

Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS), and U.S. DOT. "Airline On-Time Tables." http://www.bts.gov/programs/airline_information/airline_ontime_tables/.

Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS), and U.S. DOT. "Airport Fact Sheets." http://www.transtats.bts.gov/airports.asp.

Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS), and U.S. DOT. "Table 12: Top 85 Markets Ranked by Percentage Change 2008–2009." http://www.bts.gov/programs/economics_and_finance/air_travel_price_index/html/table_12.html.

Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS), and U.S. DOT. "Table 15: Top 85 Markets Ranked by Percent Change from 1995." http://www.bts.gov/programs/economics_and_finance/air_travel_price_index/html/table_15.html.

Copyright National Academy of Sciences. All rights reserved.

Rhode Island Airport Corporation. "Rhode Island State Airport System Plan—Draft. State Guide Plan Element 640." Rhode Island State Planning Council Technical Committee. 2007.

Rodriguez, A., and F. Bijotat. "Performance Measurement, Strategic Planning, and Performance-Based Budgeting in Illinois Local and Regional Public Airports." *Public Works Management & Policy,* Vol. 8, Issue 2, 2003, pp. 132–145.

Skytrax Research. "World Airports Customer Satisfaction Survey, 2008." http://www.airlinequality.com/AirportRanking/wacss.htm.

Spitz, W. and R. Golaszewski. *ACRP Synthesis 2: Airport Aviation Activity Forecasting.* Transportation Research Board of the National Academies, Washington, DC, 2007. http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_002.pdf.

Ted Stevens Anchorage International Airport—Performance Details. http://www.gov.state.ak.us/omb/results/view_details.php?p=220.

The MITRE Corporation Center for Advanced Aviation System Development, Federal Aviation Administration, and U.S. DOT. *Capacity Needs in the National Airspace System 2007-2025: An Analysis of Airports and Metropolitan Area Demand.* Washington, DC, 2007. http://www.faa.gov/airports/resources/publications/reports/media/fact_2.pdf

The MITRE Corporation Center for Advanced Aviation System Development, Federal Aviation Administration, and U.S. DOT. *Airport Capacity Benchmark Report 2004.* Washington, DC, 2004. http://www.faa.gov/about/office_org/headquarters_offices/ato/publications/bench/2004download.htm.

Transportation Research Board. *TRB Special Report 255: Entry and Competition in the US Airline Industry: Issues and Opportunities,* National Research Council, National Academy of Sciences, Washington, DC, 1999.

Transportation Research Laboratory. *Airport Performance Indicators 2005.* Berkshire, UK 2005.

Transportation Research Record: Journal of the Transportation Research Board, No. 1703, Issues, Problems, and Performance Measures in Airports and Airspace. Transportation Research Board, National Research Council, Washington, DC, 2000.

U.S. Environmental Protection Agency. "Airport Deicing Questionnaire." Washington, DC, 2008.

U.S. General Accounting Office. *Aviation and the Environment: Results from a Survey of the Nation's 50 Busiest Commercial Service Airports (GAO/RCED-00-222).* Government Printing Office, Washington, DC, August 2000. http://www.gao.gov/archive/2000/rc00222.pdf.

U.S. General Accounting Office. *Aviation Security: Long-Standing Problems Impair Airport Screeners' Performance (GAO/RCED-00-75).* Government Printing Office, Washington, DC, June 2000.

US News. "Airport Performance Calculator." http://www.usnews.com/usnews/biztech/airtravel/flightplan/index.html.

Vasigh, B., and J. Gorjidooz. "Productivity Analysis of Public and Private Airports: A Casual Investigation." *Journal of Air Transportation,* Vol. 11, No. 3, 2006, pp. 145–163.

Wells, A. T., and S. Young. *Airport Planning & Management.* McGraw-Hill Professional, 2004.

Winston, C., and G. de Rus. *Aviation Infrastructure Performance: A Study in Comparative Political Economy.* Brookings Institution Press, Washington DC, 2008.

Zografos, K. G., and Madas, M. A. "Advanced Modeling Capabilities for Airport Performance Assessment and Capacity Management." *Transportation Research Record: Journal of the Transportation Research Board,* No. 2007. Washington, DC, 2007, pp. 60–69.

Copyright National Academy of Sciences. All rights reserved.

Alphabetical Index of Airport Performance Indicators

A

Absenteeism Rates	HR O-1
Access to City Center	SQ O-1
Access to Ground Transportation (Arrivals)	SQ O-2
Access to Terminals (Departures)	SQ O-3
Accidents and Incidents on Airport Premises	SR K-1
Accidents on Airport-Maintained Roads and Sidewalks - Number of	SR O-2
Accounts Receivable Aging – Days	FN K-1
Accuracy of Airline Leased Premises Drawings	PC O-1
Acreage Available for Development – Airfield	PC O-2
Acreage Available for Development – Non-Airfield	PC O-3
Active-Duty Sworn Police Officers – Number of	PS O-1
Activity at Nearby Towered Airport – General Aviation	GA K-1
Actual Flight Connecting Times	SQ O-4
ADA Requirements Met During Year Compared with Total Number of ADA Requirements (%)	SQ O-5
Adverse Weather – Average Closing Time	AO O-1
Advertising Services Revenue to Airport	CN O-1
Aesthetic Appeal	SQ O-6
Air Carrier Concentration	AS O-1
Air Operations Area (AOA) Violations	PS K-1
Air Services Development (Marketing) Cost	AS O-2
Air Services Development (Marketing) Cost Included in Airline Rate Base	AS O-3
Aircraft Accidents and Incidents	SR K-2
Aircraft Damage During Snow Event	SR O-3
Aircraft Operations – Change over Prior Period	AO O-2
Aircraft Operations in Compliance with Approved Voluntary Flight Track Programs (%)	EV O-1
Aircraft Parking Positions Serviced by a Hydrant Fuel System (%)	EV O-2
Aircraft Turn Times	TO O-1
Airfare Average vs U.S. Average	AS O-4
Airfare Change over Prior Period	AS O-5
Airfield Acreage Developed	PC O-4
Airfield Citations Issued	SR O-4
Airfield Electricity Consumption – Change over Prior Period	EN K-1
Airfield Energy Consumption – Lighting, etc.	EN O-1
Airfield Non-Air Operations Area	AO O-3
Airfield Non-Runway Maintenance Cost	MN O-1
Airline Cost per Acre	FN O-1
Airline Cost per Enplanement	FN C-9
Airline Cost per Operation	FN K-2
Airline Cost per Terminal Sq. Ft.	FN O-2
Airline Costs per Gate	FN O-3
Airline Operations	FN O-4
Airline Payments as Percentage of Airport Operating Revenues	FN O-5
Airline Rental Cost per Gate	FN O-6
Airline Terminal Area in Rate Base	FN O-7
Airline Terminal Rental Revenues	FN O-8
Airport Accessibility Rating	SQ O-7

Copyright National Academy of Sciences. All rights reserved.

Airport Capital Improvement Program – Total Cost Estimate	PL O-1
Airport Central Staff Employees	FN O-9
Airport Cleanliness – Passenger Perception	SQ K-1
Airport Closures for Snow/Ice Events – Number of	AO O-4
Airport Collective Bargaining Negotiations Completed within Deadlines	HR O-2
Airport Construction Costs – Total Actual	PL O-2
Airport Construction Costs – Total Budgeted	PL O-3
Airport Cost per Enplanement	FN C-10
Airport Courtesy – Passenger Perception	SQ K-2
Airport Data Reporting to Airlines and Other Key Tenants	PC O-5
Airport Direct Operating Cost per 1000 Lbs Landed Weight	FN O-10
Airport Direct Operating Cost per Enplaned Cargo Ton	CA O-1
Airport Direct Operating Cost per Enplanement	FN O-11
Airport Direct Operating Costs	FN O-12
Airport Economic Impact – Direct and Indirect Jobs	AS O-6
Airport Economic Impact – Direct and Induced Expenditures	AS O-7
Airport Employees – Number of	HR O-3
Airport Employees (FTEs) – Change over Prior Period	HR K-1
Airport Employees (FTEs) Dedicated to Security Badging and Credentialing – Number of	PS O-2
Airport Employees Trips to Work via Public Transportation	SQ O-8
Airport Hazmat Emergency Responses within Established Standard Times per Number of Airport Hazmat Emergency Responses	AR O-1
Airport Hazmat Emergency Responses within Established Standards	AR O-2
Airport Indirect (Administrative Overhead) Cost per Enplaned Cargo Ton	CA O-2
Airport Indirect Operating (Administrative Overhead) Costs	FN O-13
Airport Indirect Operating Cost as Percentage of Total Operating Cost	FN O-14
Airport Indirect Operating Cost per 1000 Lbs Landed Weight	FN O-15
Airport Indirect Operating Cost per Enplanement	FN O-16
Airport Master Plan and Strategic Plan Updates Completed in Timely Manner	PL O-4
Airport Medical Emergency Responses within Established Standard Times per Number of Airport Medical Emergency Responses	AR O-3
Airport Medical Emergency Responses within Established Standards	AR K-5
Airport Non-Operating Costs	FN O-17
Airport Operating Cost per Enplanement	FN O-18
Airport Operating Costs	FN O-19
Airport Operating Revenue	FN O-20
Airport Operations Cost per 1000 Lbs Landed Weight	FN O-21
Airport Projects Meeting M/W/DBE Requirements without Waivers (%)	HR K-2
Airport Revenue from Non-Passenger-Dependent Sources (%)	FN K-3
Airport Vehicles – Average Age	MN K-1
Airport Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%)	EN K-2
Airport Warehouse Space	CA O-3
Airport Warehouse Space Leased (%)	CA K-1
Airport Warehouse Space – Change over Prior Period	CA O-4
All-Cargo Aircraft Landed Weight – Change over Prior Period	CA K-2
Amount of Renewable Energy Purchased by Airport Tenants	EN O-2
Annual Aircraft Operations	AO C-1
Annual Capital Cost as Percentage of Total Cost	FN O-22
Annual Employee Turnover	HR K-3

Copyright National Academy of Sciences. All rights reserved.

Annual Part 139 Inspection Results	SR K-3
Annual Safety Inspection – Number of Major Items Passed per Total Number of Major Items	SR O-5
Annual Subsidy from Primary Airport to Relievers	FN O-23
Annual Terminal Complex Energy Consumption	EN O-3
ARFF Cost – Change over Prior Period	AR K-1
ARFF Cost per Enplanement	AR K-2
ARFF Cost per Firefighter	AR O-4
ARFF Cost per Operation	AR K-3
ARFF Cost per Runway	AR O-5
ARFF Employees (FTEs)	AR O-6
ARFF Employees Who Are Not Active Firefighters	AR O-7
ARFF Overtime Cost	AR O-8
ARFF Responses within Mandated Response Times (%)	AR K-4
ARFF Salary & Benefits Cost	AR O-9
ARFF Staffing versus ARFF Index	AR O-10
Arrival Delay per Flight	SQ K-3
Asset Value per Employee	FN O-24
Assignments Completed in a Given Year – Number of	LG O-1
Assignments Completed in a Given Year (%)	LG O-2
Assignments Opened in a Given Year – Number of	LG O-3
Assignments to Legal Department Completed on Time (%)	LG O-4
Attendees at Safety Seminars – Number of	SR O-1
Availability of Children's Amenities	SQ O-9
Available Seat Miles	AS O-8
Average Acquisition Cost of Land per Square Foot	PC O-6
Average Annual Hangar Space Rental Cost	FN O-25
Average Annual Tie-Down Space Rental Cost	FN O-26
Average Contract Planning and Bid Time	PL O-5
Average Cost per Gallon Paid by General Aviation for Jet Fuel	FL O-1
Average Cost per Gallon Paid for Aviation Gasoline	FL O-2
Average Cycle Time of Key Financial Activities	FN O-27
Average Downtime for Passenger Screening Equipment	PS O-3
Average Duration – Parking in LTP and STP	PK O-1
Average Gross Revenue per Vehicle Parked	PK O-2
Average Interest Rate Paid on Long-Term Debt	FN O-28
Average Interest Rate Paid on PFC-Backed Debt	FN O-29
Average Interest Rate Paid on Total Debt	FN O-30
Average Landed Weight – Change over Prior Period	AS K-1
Average Length of Time for Processing Security Badging and Credentialing Applications	PS O-4
Average Load Factor	AS O-9
Average Number of Seats per Airline Operation	AS O-10
Average Open Positions Filled in Pay Range (by Quadrant)	HR O-4
Average PFC per Enplaned Passenger	FN O-31
Average PFC Refunds per Reporting Period	FN O-32
Average Processing Time for Short- and Long-Term Parking	SQ O-10
Average Salary Increase	HR O-5
Average Seats per Flight – Change over Prior Period	AS K-2
Average Taxi Time Gate to Runway End During Snow/Ice Events	AO O-5
Average Time Airport Closed for Adverse Weather Excluding Snow/Ice Events	AO O-6

Copyright National Academy of Sciences. All rights reserved.

Average Time Airport Closed for Snow/Ice Events AO O-7
Average Time for Airport Operations to Clear Runways of Snow/Ice Accumulation AO O-8
Average Time from Long-Term Parking to the Passenger Terminal SQ O-11
Average Time to Process Routine Lease Extensions/Amendments PC O-7
Average Time to Resolve Terminal Work Order Requests TO O-2
Average Time to Settle Contractor Claims PL O-6
Average Transaction Time – International Passenger Processing TO O-3

B

Baggage Claim – Passenger Perception SQ K-4
Based Aircraft GA C-18
Based Aircraft Counts AS O-11
Based Aircraft per FTE GA O-1
Benefit Cost per Employee HR O-6
Benefits as % of Total Compensation HR K-4
Bid Estimate to Actual Bid PL O-7
Bond Rating FN C-11
Budget Spent versus Work Completed – Specific Significant Capital Projects PL K-1
Budget Spent vs Percentage of Work Completed for Each Significant Airport Construction Project (%) PL O-8
Building Maintenance Cost – Total FN O-33
Building Maintenance Cost per Enplanement MN O-2
Buildings On-Airport That Are LEED Certified (%) EV O-3
Bulk IT Hardware Procurement (%) IT O-1
Business Services SQ O-12

C

Capital Expenditure per Enplanement FN O-34
Carbon Footprint EV K-1
Cargo Economic Impact – Direct and Induced Expenditures CA O-6
Cargo Economic Impact – Direct and Induced Expenditures per Ton CA O-7
Cargo Economic Impact – Direct Jobs CA O-8
Cargo Economic Impact – Direct Jobs per Ton CA O-9
Cargo Fees Revenue to Airport per Warehouse Square Foot CA O-10
Cargo Operating Cost per Ton CA O-11
Cargo Operating Cost per Ton of CMGTW CA O-12
Cargo Operating Costs CA O-13
Cargo Revenue to the Airport as a Percent of Total Airport Operating Revenue CA O-14
Cargo Revenue to the Airport per Ton CA O-15
Cargo Space Leased per Ton Moved CA O-5
Cargo Tons – Change over Prior Period AS C-2
Cargo Tons Deplaned CA O-16
Cargo Tons Enplaned CA O-17
Cash Flow / Cap-X FN O-35
CCTV-Equipped Airfield and Perimeter Security Checkpoints – Number of PS O-5
CCTV-Equipped Airfield and Perimeter Security Checkpoints to Total (%) PS O-6
CCTV-Equipped Passenger Security Screening Checkpoints – Number of PS O-7
CCTV-Equipped Passenger Security Screening Checkpoints to Total (%) PS O-8
Certification Status of Environmental Management System EV O-4
Certifications Held by Specific Departments – Number of HR O-7
Change in Future Scheduled Airline Seats Year-over-Year AS O-12

Copyright National Academy of Sciences. All rights reserved.

Change Order Dollars as Compared to Original Contract Price (%)	PL O-9
Change Orders – Number Outstanding for Each Significant Airport Construction Project	PL O-10
Change Orders – Number per Airport Construction Project	PL O-11
Change Orders as % of Base Budget – Specific Significant Capital Projects	PL K-2
Charter Flights – Number of	AS O-13
Check-In Rating Including Bag Check	SQ O-13
Claim Cost per Million Enplaned Passengers	SR O-6
Claims Settled vs Initial Amount of Claims for Each Significant Airport Construction Project (%)	PL O-12
Closures for Adverse Weather	AO K-1
Community Complaints – Average Time to Respond	PA K-1
Community Complaints – Number Received	PA K-2
Community Outreach Activities – Number of	PA O-1
Comparable Pay in Critical Categories	HR O-8
Complaints Regarding Signage Maintained by Airport	SQ O-14
Complaints Regarding Signage Maintained by Airport Tenants	SQ O-15
Concession Area per 1,000 Enplanements	CN O-2
Concession Gross Sales per Enplanement	CN K-1
Concession Gross Sales per Square Foot	CN K-2
Concession Net Concession to Airport as Percentage of Gross Concession Sales	CN O-3
Concession Revenue as a Percentage of Total Airport Revenue	CN O-4
Concession Revenue Offsetting Airline Fees	FN O-36
Concession Revenue to the Airport as % of Total Operating Revenue	CN C-6
Concession Revenue to the Airport per Enplanement	CN C-7
Concession Revenue to the Airport per Square Foot	CN K-3
Concession Services Gross Sales	CN O-5
Concessionaires and Airlines Participating in Airport-Wide Customer Satisfaction Programs – Number of	SQ O-16
Concessionaires and Airlines Participating in Airport-Wide Safety Programs – Number of	SR O-7
Consistent and Timely Plan Review and Permit Issuance (%)	PL O-13
Construction & Demolition Waste Recycled/Reused/Composted (%)	EV O-5
Construction Cost per Parking Space	PL O-14
Construction Injuries	SR K-4
Construction Projects – Actual vs. Budgeted Costs of Significant Projects	PL C-25
Contract Deadlines Missed	PC O-8
Contract Extensions – Number Given	PC O-9
Contract Management Billing	PC O-10
Contract Reviews Completed on Time (%)	LG K-1
Contract Services Cost as % of Total Operating Cost	FN K-4
Contractor Claims – Number vs Number of Airport Construction Projects	PL O-15
Contractor Claims Settled without Litigation vs Total Number of Claims	PL O-16
Contracts in Place by Renewal/Start Date (%)	PC O-11
Contracts/Leases – Number Negotiated and Executed	PC O-12
Cost of Claims from On-the-Job Employee Injuries per $100 of Total Airport Payroll	SR O-8
Cost of Damages to Aircraft During Adverse Weather Events Other than Snow/Ice	SR O-9
Cost of Damages to Terminals, Other Structures, During Adverse Weather Events Other than Snow/Ice	SR O-10

Copyright National Academy of Sciences. All rights reserved.

Cost of Elevator/Escalator/Moving Sidewalk Maintenance	MN O-3
Cost of Equipment Failure	FN O-37
Cost of Maintaining Roadways – Non-Airfield	MN O-4
Cost of Maintenance – Fleet Types	MN O-5
Cost of Maintenance – Specific Vehicles	MN O-6
Cost of Police Officers Assigned to Airfield and Perimeter	PS O-9
Cost of Police Officers Assigned to Passenger Screening	PS O-10
Cost of Property Damage – On-Airport Accidents – Airport Operator	SR O-11
Cost of Property Damage – On-Airport Accidents – Total Airport	SR O-12
Cost to Budget Ratios	FN O-38
Crimes Reported on the Airport	PS K-2
Crown Rents Paid	FN O-39
Curb Time per Arriving Vehicle	PS O-11
Curb-to-Gate Distance	SQ O-17
Curb-to-Gate Time	SQ O-18
Current PFC Collection Level/Totals to Potential PFC Revenue	FN O-40
Custodial/Janitorial Cost – Total	MN O-7
Custodial/Janitorial Cost per Square Foot of Terminal	MN K-2
Customer Complaints, Number of by Type	SQ O-19
Customer Satisfaction Indicators	SQ O-20
Customer Satisfaction with Airport	SQ C-29

D

Days Open Positions Remain Vacant After Being Posted – Number of	HR O-9
Days Unrestricted Cash on Hand	FN C-12
Days without Serious Accident/Injury on Airport Construction Projects	SR O-13
DBE Contractor Fees as Percentage of Total Contractor Fees	HR O-10
DBE Contractors Working at Airport on Annual Basis – Number of	HR O-11
DBE/MBE Contracts as a Percentage of Total Contracts	HR O-12
DBE/MBE Participation Rate on Specific Projects	HR O-13
Debt – Other than Long-Term	FN O-41
Debt / Equity Percentage	FN O-42
Debt per Enplanement	FN C-13
Debt per O&D Enplaned Passenger	FN O-43
Debt per Operation	FN O-44
Debt Ratio	FN O-45
Debt Service as % of Operating Revenue	FN K-5
Debt Service Coverage Ratio	FN C-14
Debt Service Payments Net of PFCs per Enplanement	FN O-46
Debt Service Safety Margin	FN O-47
Declared Capacity of Airport	AO O-9
Deicing – % Fluid Recovered	EV K-2
Deicing Fluid Discharges per Total Deicing Operation – Total Airport	EV O-6
Delay Curve	SQ O-21
Departure Delay per Flight	SQ K-5
Depreciation Cost per Enplanement	FN O-48
Design Changes – Number for Each Significant Airport Construction Project:	PL O-17
Direct CO_2 Emissions	EV O-7
Direct Operating Cost per Airport Employee	FN O-49
Disabled Access	SQ O-22
Disabled Employees	HR O-14

Copyright National Academy of Sciences. All rights reserved.

Disaster Drills per Period – Number of AR O-11
Dollar Amount of Change Orders Outstanding for Each Significant Airport Construction Project PL O-18
Dollar Amount of Contractor Claims vs Total Dollar Amount of Airport Construction Projects PL O-19
Dollar Amount of Fees & Expenses Paid to Outside Counsel FN O-50
Dollar Value of Projects Completed PL O-20
Domestic Belly Cargo Tons Enplaned CA O-18
Domestic Cargo Flights CA O-19
Domestic Cargo Flights – Change over Prior Period AS K-3
Domestic Cargo Tons – Change over Prior Period CA K-3
Domestic Enplanements – Change over Prior Period AS O-14
Domestic Flights – Number of All Cargo AS O-15
Domestic Flights – Number of Passenger AS O-16
Domestic Freighter Cargo Tons Enplaned CA O-20
Domestic Landed Weight – All-Cargo Aircraft AS O-17
Domestic Landed Weight – Passenger Flights AS O-18
Domestic Transit Cargo in Tons CA O-21
Driver Courtesy – Airport Passenger Vehicles SQ O-23
Duration of Terminal Concession Leases CN O-6
Duty-Free Gross Sales CN O-7
Duty-Free Net Revenue to Airport CN O-8
Duty-Free Gross Sales per International Departing Passenger CN O-9

E

Earnings (Net Revenues) FN O-51
Ease of Connection – Passenger Perception SQ K-6
EBIT Margin FN O-52
EBITDA FN O-53
Economic Impact AS K-4
Economic Impact of Cargo Operations CA K-4
Electric Cost per Enplanement EN O-4
Electric Cost per Terminal Bldg Area with Electric Service (s.f.) EN O-5
Electricity Consumption – Annual EN O-6
Electricity Consumption per Square Foot of Terminal – Annual EN O-7
Elements of Capital Funding as % of Total Capital Funding FN O-54
Elevators/Escalators/Moving Sidewalks – Number of MN O-8
Employee Accidents and Injuries – Lost Work Days SR C-27
Employee Attitude Change Scores HR O-15
Employee Evaluations – Timeliness HR K-5
Employee Job Satisfaction HR K-6
Employee Lost Time to Illness or Accident – Airport Operator SR O-14
Employee Opinion on Management Policies HR O-16
Employees Participating in a Ride-Share or Other Employee Trip-Reduction Program – Number of SQ O-24
Employees Using Public Transport (%) SQ O-25
Energy Consumption per Square Foot of All Airport Buildings EN O-8
Energy Consumption per Square Foot of Terminal Area EN O-9
Energy Costs per Enplanement EN O-10
Energy-Efficient Entryways in Airport-Owned/Operated Buildings – Percentage of EN O-11
Energy-Efficient Lighting in Use – Airport Wide – Percentage of EN O-12

Copyright National Academy of Sciences. All rights reserved.

Energy-Efficient Lighting in Use in Terminals – Percentage of EN O-13
Energy-Efficient Windows in Airport-Owned/Operated Buildings – Percentage of EN O-14
Enplaned Cargo Tons per Airport Employee CA O-22
Enplanements – Change over Prior Period AS C-3
Enplanements per Airport Employee FN O-55
Enplanements per Airport Employee HR K-7
Enplanements per Gate TO K-1
Enplanements per Terminal Square Foot TO K-2
Environmental Program Capital Budget EV O-8
Environmental Program Operating Budget EV O-9
Environmental Reviews – Timeliness of Completion EV K-4
Environmental Violations – Number of NOVs EV K-5
Error Rates in Processing Benefit Claims HR O-17
Errors in Accounting Reports FN O-56
Escalators, Moving Walkways, and Elevators – Percent of Time in Service MN K-3
Existence of Environmental Management System EV O-10

F

FAA Cargo Discretionary Funding per Cargo Ton GR O-1
FAA Discretionary Funding per Enplanement GR O-2
FAA Discretionary Grant Funding Awarded Annually GR K-1
FAA Entitlement Funding GR O-3
FAA Total Grant Funding Awarded Annually GR K-2
Failure to Challenge Violations PS O-12
Failure to Display Security Badge Violations PS O-13
Fatalities on Airport Construction Projects – Number of SR O-15
FBO Revenue to the Airport – Change over Prior Period CN K-4
Firefighters – Number of AR O-12
Fires – Number of AR O-13
Fleet Usage by Type of Vehicle MN O-9
Flexibility of Police Staffing PS O-14
Flight Ground Delays SQ O-26
Flights Arriving More than 30 Minutes Late (%) SQ O-27
Flights Departing More than 30 Minutes Late (%) SQ O-28
Flights in Compliance with Noise Abatement Procedures (%) EV O-11
Flights per Day AS O-19
FOD – Number of Items Found per Inspection AO-K-2
FOD Damage ($) AO O-10
Food & Beverage – Pricing CN O-10
Food & Beverage – Quality CN O-11
Food & Beverage – Range of Offerings CN O-12
Food & Beverage Gross Sales CN O-13
Food & Beverage Net Revenue to Airport CN O-14
Fossil Fuel to Total Fuel Usage – Percentage of EN O-15
Frequency of FOD Inspections SR O-16
Frequency of Ground Transportation Service SQ O-29
Frequency of Internal Performance Auditing of Departments and Activities FN O-57
Fuel Consumption of Airport Vehicles EN O-16
Fuel Discharges per Total Fueling Operations – Total Airport EV O-12
Fuel Sales Net Profit/Loss or Fuel Flowage Fees FL K-1

Copyright National Academy of Sciences. All rights reserved.

Fuel Use/Sales – Change over Prior Period GA C-19
Full Time Equivalent (FTE) Employees – Number of HR O-18

G

Gallons of Fuel Sold per Flight – Commuters/Regional FL O-3
Gallons of Fuel Sold per Flight – Domestic FL O-4
Gallons of Fuel Sold per Flight – Freighters (Cargo) FL O-5
Gallons of Fuel Sold per Flight – International FL O-6
Gallons per Refueling Unit (Trucks, Filters, Meters, Fuel Pits) FL O-7
Gas Mileage – Vehicles and Ground Equipment Fleet – Airport MN O-10
Gas Mileage – Vehicles and Ground Equipment Fleet – Tenants MN O-11
Gate Availability SQ O-30
Gate Utilization TO K-3
Gates – Number of TO O-6
Governing Body Employees Dedicated to Airport – Number of HR O-19
Grant Funding Other than FAA Awarded Annually GR K-3
Grievance Settlements Costs HR O-20
Ground Equipment Damage During Snow/Ice Events SR O-17
Ground Power In-Service Percentage MN O-12
Groundskeeping Maintenance Cost per Acre MN O-13

H

Hangar Rental and Ground Lease Income GA C-20
Hangar Rental Rates Compared to Nearby Airport PC K-1
Heating & Cooling Degree Days EN O-17
Hits on Airport Website AS O-20
Homes in 65 Ldn That Have Avigation Easements Attached (%) EV O-13
Homes in 65 Ldn That Have Been Mitigated (%) EV O-14
Homes Subjected to Specified Noise Level (%) EV O-15
Hotel Net Revenue to Airport CN O-15
Hours Flown GA O-2
Hours per Firefighter per Week AR O-14
HVAC Cost per Enplanement MN O-14
HVAC Cost per Terminal Building Area with HVAC Service (s.f.) MN O-15
HVAC Equipment Meeting Energy-Efficiency Guidelines – Percentage of EN O-18

I

Indirect CO_2 Emissions EV O-16
Injuries and Incidents – Passengers and Other Public On-Airport – Number of SR O-18
Injuries per FTE SR K-5
Insurance Premium Costs per Enplaned Passenger SR O-19
Interest Payments on Debt Other than Long-Term FN O-58
Interest Payments on Long-Term Debt per 1000 Lbs Landed Weight FN O-59
Interest Payments on Long-Term Debt FN O-60
Interest Payments on Long-Term Debt per Cargo Ton FN O-61
Interest Payments on Long-Term Debt per Enplanement FN O-62
Interest Payments on PFC-Backed Debt FN O-63
International Arriving Passengers AS O-21
International Belly Cargo Tons Enplaned CA O-23
International Cargo Flights CA O-24

Copyright National Academy of Sciences. All rights reserved.

International Cargo Flights – Change over Prior Period	AS K-5
International Cargo Tons – Change over Prior Period	CA K-5
International Enplanements – Change over Prior Period	AS O-22
International Flights – Number of All Cargo	AS O-23
International Flights – Number of Passenger	AS O-24
International Freight Tons Enplaned	CA O-25
International Landed Weight – All-Cargo Aircraft	AS O-25
International Landed Weight – Passenger Flights	AS O-26
International Passengers to Total Passengers (%)	AS O-27
International Transit Cargo in Tons	CA O-26
Inter-Terminal Transportation – Wait Times at Peak Periods	SQ O-31
Inventory Shrinkage (%)	FN O-64
Investment Income	FN O-65
Investment Income as % of Invested Assets	FN K-6
IT Customer Satisfaction	IT O-2
IT Network Security – Number of Attacks	IT O-3
IT Network Security – Containment	IT O-4
IT Network Security – ISS Reviews	IT O-5
IT Network Security – PCI Compliance and Reporting	IT O-6
IT Network Security – Vulnerability Identification	IT O-7
IT System Maintenance Rework (%)	IT O-8
IT System Security – Denial of Service	IT O-9
IT System Security – Intrusion Prevention (%)	IT O-10
IT Systems – Airport Website Content Posting	IT O-11
IT Systems – Data Back Up Completion (%)	IT O-12
IT Systems – Data Restoration (%)	IT O-13
IT Systems – Equipment Malfunctions Advance Warning (%)	IT O-14
IT Systems – Hardware Compatibility Assurance (%)	IT O-15
IT Systems – Software Compatibility Assurance (%)	IT O-16
IT Systems – Software Quality Assurance (%)	IT O-17
IT Systems – Website Links Malfunctioning (%)	IT O-18
IT Systems – Workstation Customer Information (%)	IT O-19
IT Systems – Workstation Repair (%)	IT O-20
IT Systems – Workstation Service Time	IT O-21

J

Jet Bridge In-Service Percentage	MN O-16
Jet Bridge Maintenance Cost	MN K-4

L

Labor Cost per Refueling Unit	FL O-8
Labor Costs – Fueling Operations	FL O-9
Labor Grievances – Number of	HR O-21
Labor Utilization Rates	FN O-66
Landed Weight (000 Lbs)	FN O-67
Landing Fee Rate	PC C-26
Landing Fee Revenues	FN O-68
Landscaping That Is "Xeriscape" Landscaping (%)	EV O-17
Landscaping Water Usage That Comes from a Water Re-Use/Recapture Program (%)	EV O-18
Landside (Excl. Terminals) Energy Consumption	EN O-19

Copyright National Academy of Sciences. All rights reserved.

LEED Building Projects – % New Building Projects Being Built to LEED Standards EV K-3
Legal Dept Budget % Represented by Fees & Expenses Paid to Outside Counsel LG O-5
Levels of Airport Funds Over Time FN O-69
Long-Term (Daily) Parking Spaces per O&D Passenger – Number of PK O-3
Long-Term Debt as % of Total Assets FN O-70
Long-Term Goals Achieved (%) FN O-71
Longevity of Consumables in Various Categories vs Expected Lives FL O-10
Long-Term Debt FN O-72
Long-Term Debt per 1000 Lbs Landed Weight FN O-73
Long-Term Debt per Enplaned Cargo Ton CA O-27
Long-Term Debt per Enplanement FN K-7
Lost Work Days per FTE SR K-6

M

M/W/DBE Participation Rate; Actual vs. Goal HR C-21
Maintain Effective Working Relationship with Airline Tenants – Subjective PC O-13
Maintenance Cost per Parking Space PK O-4
Maintenance Cost per Square Foot of Terminal MN K-5
Maintenance Inspections per Year MN O-17
Maintenance Work Orders per Vehicle MN O-18
Material & Supply Costs per Enplaned Passenger FN O-74
Material Costs – Airport Fueling Operations FL O-11
Materials Cost per Refueling Unit FL O-12
Matters Referred for Handling by Outside Counsel – Number of LG O-6
Matters Referred for Handling by Outside Counsel (%) LG O-7
Maximum Throughput Capacity of Airport (Saturation Capacity) AO O-11
Mean Time to Repair IT K-1
Mechanic Man-Hours – Fueling Operations FL O-13
Mechanical Systems – Duration of System Failure MN O-19
Media Calls Responded to within the Same Day – Number of PA O-2
Media Inquiries – Number Received PA K-3
Media Mentions – Number PA K-4
Media Outreach Contacts – Number of PA O-3
Minimum Flight Connecting Times SQ O-32
Minority Employees at Upper Management Levels (%) HR O-22
Minority Employees to Total Employees (%) HR O-23

N

Net Fixed Assets FN O-75
Net Operating Income per Enplanement FN K-8
Net Operating Revenue FN O-76
Net Operating Revenue After Debt Service FN O-77
Net Working Capital (Operating Liquidity) FN K-9
Network-in-Service Time (%) IT K-2
New Certifications Acquired – Number of HR O-24
News & Gift – Pricing CN O-16
News & Gift – Quality CN O-17
News & Gift – Range of Offerings CN O-18
News & Gift Concession Gross Sales CN O-19
News & Gift Concession Net Revenue to Airport CN O-20

Copyright National Academy of Sciences. All rights reserved.

272 Resource Guide to Airport Performance Indicators

Night Operations – % Using Preferential Runways EV K-6
Night Operations – Preferential Runways Used (%) EV O-19
Noise Abatement Procedures – % Compliance EV K-7
Noise – Number of Homes within 65 dBA DNL EV K-8
Non-Aeronautical Operating Revenue as % of Total Operating Revenue FN C-15
Non-Aeronautical Operating Revenue per Enplanement FN C-16
Non-Aeronautical Revenue from Reliever Airports FN O-78
Non-Aeronautical Revenue Generated Through New (Not Replacement) Businesses FN O-79
Non-Airfield Acreage Developed FN O-80
Non-Airline Operations AS O-28
Non-Commercial Traffic as a Percentage of Total Traffic AS O-29
Non-Operating Cost per Enplanement FN O-81
Nonstop Destinations – Change in Number of Domestic & International AS C-4
Nonstop Domestic Destinations – Number of AS O-30
Nonstop International Destinations – Number of AS O-31
Nuclear Energy Used on Airport – Percentage of EN O-20
Number of Aircraft Noise Complaints EV O-20
Number of Airport Patrons Utilizing Pay-On-Foot Parking EV O-21
Number of Clean-Fuel Vehicles Owned by Airport EV O-22
Number of Flight Track Violations EV O-23
Number of Flights per Gate by Individual Carrier TO O-4
Number of Flights per Gate per Day TO O-5
Number of Jet Bridges on Airport TO O-12
Number of LEED-Certified Buildings on Airport EV O-24
Number of Staff Reporting to Environmental Manager EV O-25
Number of Tons of Construction and Demolition Waste Recycled/Reused/Composted EV O-26
Number of Tons of Solid Waste Recycled/Reused/Composted EV O-27
Number of Violations of Airport Ground Run-Up Procedures EV O-28

O

O&D Passengers FN O-82
O&D Passengers – Change over Prior Period AS O-32
O&D Passengers % of Total Passengers AS O-33
Occupancy in Airport Parking Facilities PK O-5
Occupational Injuries and Illness – Total Airport – Number of SR O-20
Occupational Injuries and Illnesses – Airport Operator – Compared with National Averages – Number of SR O-21
Off-Airport Cargo Warehouse Throughput CA O-28
On-Airport Cargo Warehouse Throughput per Square Foot CA O-29
Operating Cost per Enplanement FN C-17
Operating Cost per Enplanement (with Depreciation) FN O-83
Operating Cost per Operation FN K-10
Operating Margin FN O-84
Operating Revenue per Employee FN O-85
Operations per Airport Employee FN O-86
Operations per Gate TO O-9
OSHA-Reportable Injuries SR K-7
Other Concession and Development Net Revenues to Airport CN O-21
Other Concessions (Specialty Retail, Duty Free, Services) – Pricing CN O-22

Copyright National Academy of Sciences. All rights reserved.

Other Concessions (Specialty Retail, Duty Free, Services) – Quality	CN O-23
Other Concessions (Specialty Retail, Duty Free, Services) – Range of Offerings	CN O-24
Other Operating Expenses per Enplaned Passenger	FN O-87
Outside Contract Services Cost as Percentage of Direct Operating Cost	FN O-88
Outside Counsel Fees & Expenses	LG K-2
Overtime Cost as a Percentage of Total Wages	HR O-25
Overtime Cost as Percent of Total Wages	HR K-8
Overtime Cost as Percentage of Police Salary and Benefits Cost	PS O-15
Overtime Cost as Percentage of Total ARFF Cost	AR O-15
Overtime Cost for LEOs Assigned to Airfield and Perimeter Security	PS O-16
Overtime Cost for Police Officers Assigned to Passenger Screening	PS O-17

P

Parking Demand by Day	PK O-6
Parking Demand by Hour	PK O-7
Parking Gross Revenue	PK O-8
Parking Gross Revenue per O&D Passenger	PK O-9
Parking Net Revenue to the Airport per O&D Passenger	PK O-10
Parking Revenue Gross Sales	PK O-11
Parking Revenue Net Revenue to Airport	PK O-12
Parking Revenue per Transaction	PK K-1
Parking Revenue to the Airport per Originating Passenger	PK C-24
Parking Spaces	PK K-2
Parking Spaces – Number On – and Off – Airport	PK O-13
Parking Spaces per O&D Passenger – Number of	PK O-14
Parking Transactions per Month by Parking Product	PK K-3
Parking Utilization – Peak Period	PK K-4
Passenger Airline Aeronautical Fees	PC K-2
Passenger Assistance Services	SQ O-33
Passenger Flights – Change in Number of Domestic & International	AS C-5
Passenger Perception of Cleanliness	SQ O-34
Passenger Perception of Departure Lounge Seat Availability	SQ O-35
Passenger Sensitive Equipment In-Service Percentage	MN O-20
Passenger Wait Times at Major Processing Sites	SQ O-36
Passengers Traveling to Markets Served by Nonstop Flights (%)	AS O-34
Pay-On-Foot Parking Users to Total Number of Patrons Parking (%)	EV O-29
Peak Period	AO O-12
People Taking Airport Tours – Number of	PA O-4
Percent of Arriving Flights Delayed	SQ K-7
Percent of Departing Flights Delayed	SQ K-8
Percent of Hangar Space Leased	PC K-3
Percent of Terminal Space Leased	PC K-4
Performance Reviews Over Time for Total Work Force – Number of	HR O-26
Personnel Cost per Enplanement	FN K-11
Personnel Lost Time Costs	FN O-89
PFC-Backed Debt per Enplanement	FN O-90
Piggybacking Violations per Year	PS O-18
Pilot Counts	GA O-3
Police & Security Guard Costs – Change over Prior Period	PS K-3
Police & Security Guard Costs per Enplanement	PS K-4
Police Cost per Enplanement	PS O-19

Copyright National Academy of Sciences. All rights reserved.

Police Cost per Security Checkpoint PS O-20
Police Department Cost per Sworn Officer PS O-21
Police Department Salary & Benefits Cost PS O-22
Police Management Employees Other than Active-Duty Sworn Officers PS O-23
Police Officers Assigned to Passenger Screening – Number PS O-24
Police Overtime Cost PS O-25
Police Overtime Cost as Percentage of Total Police Department Cost PS O-26
Police Response within Federal Security Requirements per Number of Police Security Responses PS O-27
Police Responses within Federal Security Requirements PS O-28
Positive vs. Negative Mentions (%) PA O-5
Practical Hourly Capacity AO K-3
Pre- & Post-Test Scores from Training Programs HR O-27
Pre-Conditioned Air In-Service Percentage MN O-21
Press Releases Issued – Number of PA O-6
Preventative Maintenance Costs Compared to Total Maintenance Costs FN O-91
Preventive Maintenance Hours Spent MN O-22
Private Investment at the Airport FN O-92
Private Sector Contracts – Number of PC O-14
Privately-Operated Off-Airport Parking Spaces as Percent of Total Parking Spaces PK K-5
Profit Margin FN O-93
Project Completion Relative to Schedule – Specific Significant Capital Projects PL K-3
Project Cost versus Budget – Specific Significant Capital Projects PL K-4
Projected to Actual PFC Collections FN O-94
Projects Completed – Number PL O-21
Promptness of Payment to Vendors and Contractors PC O-15
Properties Contract Administration – Accuracy of Tracking in Database PC O-16
Property Transactions Completed on Timely Basis as Required by CIP – Percent PC O-17
Public Restroom Sinks Equipped with Automatic Shutoff/Water Flow Control Devices (%) EV O-30
Public Restroom Toilets with Low-Flow Devices (%) EV O-31
Publication of Annual Environmental Report – Y/N EV O-32
Punch List Items – Number Outstanding for Each Significant Airport Construction Project PL O-22
Purchases Included in "Green Purchasing" Program as % of Eligible Purchases (%) EV O-33

R

Ratio of Airport Central Staff to Total Staff Employees HR O-28
Ratio of Parking Net Revenue to Parking Gross Sales PK O-15
Ratio of Productive Labor Hours to Actual Labor Hours FN O-95
Reduction in Discharged De-Icing Material to Nearby Waterways (%) EV O-34
Refueler Man-Hours per Shift FL O-14
Refueler Staffing Man-Hours FL O-15
Relative Levels of Airport Cost Elements per Enplanement FN O-96
Relative Levels of Airport Revenue Elements per Enplanement FN O-97
Renewable Energy Compared to Total Energy Consumption, Airfield – Percentage of EN O-21

Copyright National Academy of Sciences. All rights reserved.

Renewable Energy Compared to Total Energy Consumption, Landside (Excl. Terminals) – Percentage of	EN O-22
Renewable Energy Generated by the Airport (%)	EN K-3
Renewable Energy Purchased by the Airport (%)	EN K-4
Renewable Energy Used on Airport – Percentage of	EN O-23
Renewable Energy Utilized Compared to Total Energy Consumption, Terminal Complex – Percentage of	EN O-24
Rental Car Fleet Comprised of Low-Emissions or Alternative Fuel Vehicles (%)	EV O-35
Rental Car Revenue Gross Sales	CN O-25
Rental Car Revenue Net Revenue to Airport	CN O-26
Rental Car Revenue to Airport per Enplanement	CN O-27
Rental Car Revenue to the Airport per Destination Passenger	CN C-8
Repair Cost per Refueling Unit	FL O-16
Repair Costs – Fueling Operations	FL O-17
Reportable Discharges, Number	EV K-9
Response Time to Community Complaints	PA O-7
Return on Cash Balances	FN O-98
Return on Equity	FN O-99
Revenue Passenger Miles	AS O-35
Revenue per Day per Parking Space	PK K-6
Revenue to Expenditure Ratio	FN O-100
Roadways – Airfield	AO O-13
Routine Reports – Percent on Time	FN O-101
Routine Reports per Accountant	FN O-102
Runway Clearing Time – Average for Snow/Ice	AO K-4
Runway Incursions	SR C-28
Runway Incursions by Aircraft During Adverse Weather	SR O-22
Runway Incursions by Aircraft During VMC	SR O-23
Runway Incursions by Ground Vehicles During Adverse Weather	SR O-24
Runway Incursions by Ground Vehicles During VMC	SR O-25
Runway Light Damage per Snow Event	AO O-14
Runway Longevity	AO O-15
Runway Longevity vs Expected Useful Lives	AO O-16
Runway Maintenance Cost	MN O-23
Runway/Taxiway Maintenance Cost	MN K-6
Runways – Number of	AO O-17

S

Safety Code Violations	SR K-8
Safety Seminars Conducted – Number of	SR O-26
Salaries, Wages & Benefits as Percentage of Direct Operating Cost	FN O-103
Salaries, Wages & Benefits Cost – Total	FN O-104
Salaries, Wages & Benefits Cost per Enplanement	FN O-105
Salaries, Wages & Benefits Costs per 1000 Lbs Takeoff Weight	HR O-29
Salary & Benefits & Expenses Cost of In-House Legal Staff vs Fees & Expenses Paid to Outside Counsel	LG O-8
Salary + Wages + Benefits Cost as % of Total Operating Cost	HR C-22
Salary + Wages + Benefits Cost per Airport Employee	HR C-23
Schedule Performance for Each Significant Airport Construction Project	PL O-23
Security Alarms – Airfield and Perimeter – Number of	PS O-29
Security Alarms Terminal Area – Number of	PS O-30

Copyright National Academy of Sciences. All rights reserved.

Security Badges Pulled – Number of	PS O-31
Security Breaches and Violations	PS O-32
Security Checkpoint Rating	SQ O-37
Security Checkpoint Throughput Times	PS O-33
Security Cost per Enplaned Passenger	PS O-34
Security False Alarms Terminal Area – Number of	PS O-35
Security FTE Headcount	PS O-36
Security Inspections Conducted – Number of	PS O-37
Security Responses within Established Response Time (%)	PS K-5
Senior Debt Service Coverage	FN O-106
Serious Accidents/Injuries on Airport Construction Projects – Number of	SR O-27
Short Term Parking Spaces per O&D Passenger – Number of	PK O-16
Short-Term Debt per Enplanement	FN O-107
Specialty Retail Gross Sales	CN O-28
Specialty Retail Net Revenue to Airport	CN O-29
Speed of Grant Application Processes and Receipt of Funds	GR O-4
Stage 2 Operations < 75,000 Lbs	EV K-10
Successful Outcomes in Litigation (%)	LG O-9
Surveys – Number and Frequency of	SQ O-38
Sustained Capacity of Airport	AO O-18
Sworn Police Officer Average Salary (5+ Years Experience)	PS K-6

T

Taxi Revenues to Airport	CN O-30
Taxi Availability – Numbers	SQ O-39
Taxi Availability – Wait Times	SQ O-40
Taxi Time – Gate to Runway End, Adverse Weather vs. Normal	AO O-19
Taxi Time – Gate to Runway End, Peak vs. Unimpeded	AO K-5
Taxicabs Comprised of Low Emission or Alternative Fuel Vehicles (%)	EV O-36
Taxiway Longevity	AO O-20
Taxiway Longevity vs Expected Useful Lives	AO O-21
Telecommunications Costs per Enplanement	FN O-108
Tenant Vehicles – Average Years in Service	MN O-24
Tenant Vehicles and Ground Service Equipment Converted to Energy-Efficient Types (%)	EN K-5
Tenants Inspected Annually for Environmental Compliance (%)	EV O-37
Terminal Area per Enplaned Passenger	SQ O-41
Terminal Area with HVAC Service	MN O-25
Terminal Building Custodial/Janitorial Cost	MN O-26
Terminal Building Electricity Consumption per Square Foot – Change over Prior Period	EN K-6
Terminal Building Maintenance Cost	MN O-27
Terminal Concession Area in Use – Post-Security	CN O-31
Terminal Concession Area in Use – Pre-Security	CN O-32
Terminal Concession Gross Sales	CN O-33
Terminal Concession Net Revenues to Airport per O&D Enplanement	CN O-34
Terminal Construction Cost per Passenger	PL O-24
Terminal Electric Cost	EN O-25
Terminal Elevator/Escalator/Moving Sidewalk Maintenance Cost per Unit	MN O-28
Terminal Elevator/Escalator/Moving Sidewalk Operating Cost per Unit	MN O-29

Copyright National Academy of Sciences. All rights reserved.

Terminal Facilities Overall Rating	SQ O-42
Terminal HVAC Cost	MN O-30
Terminal Rental Rate	PC K-5
Terminal Security Evacuations – Number of	PS O-38
Terminal Square Footage per Airport Employee	FN O-109
Terminal Utilities Cost per Terminal Building Area with Utility Service (s.f.)	EN O-26
Terminal Work Order Requests Resolved to Total Number Received (%)	TO O-11
Thefts in Passenger Screening Areas – Number of	PS O-39
Thefts Reported in Terminal Area	PS K-7
Time to Cure Negative Comments or Complaints	SQ O-43
Time to Respond to Negative Comment Cards or Complaints	SQ O-44
Tool Shrinkage (%)	FN O-110
Total Airport Building Maintenance Cost per Area Maintained (S.F.)	MN O-31
Total Airport Cost per 1000 Lbs Landed Weight	FN O-111
Total Airport Cost per Cargo Ton	CA O-30
Total Airport Costs	FN O-112
Total Airport Custodial/Janitorial Cost per Enplanement	MN O-32
Total Airport Debt	FN O-113
Total Airport Electric Cost	EN O-28
Total Airport Energy Consumption	EN O-29
Total Airport Expenses per Acre	FN O-114
Total Airport Interest Payments	FN O-115
Total Airport Operating Cost per Airport Employee	FN O-116
Total Airport Revenue	FN O-117
Total Airport Utilities Cost	EN O-30
Total Building Area with HVAC Service	MN O-33
Total Dollar Value of PFC Refunds	FN O-118
Total Dollar Value of PFCs Collected	FN O-119
Total Grant Funding per Passenger	GR O-5
Total HVAC Cost	MN O-34
Total Landed Weight – Change over Prior Period	AS K-6
Total Landside Revenue per Enplanement	FN O-120
Total Maintenance Cost per Square Foot of Buildings and Paved Areas	FN O-121
Total Outside Contract Services Cost	FN O-122
Total PFC-Backed Debt	FN O-123
Total Police Department Employees	PS O-40
Total Professional Services Costs	FN O-124
Total Revenue to the Airport from Cargo Activities	CA O-31
Total Terminal Area Dedicated to Concessions	CN O-35
Total Terminal Concession Area in Use	CN O-36
Total Utilities/Energy Cost-Terminal Buildings-Change over Prior Period	EN O-27
Total Water and Sewer Cost	EV O-38
Touch and Go Operations	AO O-22
Tours Conducted and Special Events Sponsored – Number of	PA O-8
Traffic Management Cost per Enplanement	PS O-41
Traffic Tickets Issued – Number of	PS O-42
Training / Course Student-Hours	HR O-30
Training / Course Volume – Various Specific Departments/Functions	HR O-31
Training / Customer Satisfaction	HR O-32
Training / Updates and New Course Development	HR O-33

Copyright National Academy of Sciences. All rights reserved.

Training Cost per Airport Employee HR O-34
Training Hours per Employee HR K-9
Training Hours per Employee – Number of HR O-35
Transit System In-Service Percentage SQ O-45
Transportation Services Net Revenue to Airport CN O-37
Truck Waiting Time CA O-32
Turnover Rate of Probationary Employees HR O-36

U

Unrestricted Financial Assets (Including Cash) FN O-125
Usable Gates – Number of TO O-7
Usable Gates in Service – Number TO O-8
Usable Gates in Service (%) TO O-10
Utilities/Energy Cost per Square Foot of Terminal Building EN K-8
Utilities/Energy Cost, Airport Total – Change over Prior Period EN K-7
Utility Costs per Enplanement EN O-31
Utility Costs per Square Footage – Terminal Complex EN O-32
Utilization Level of Parking Spaces PK O-17

V

Vacancies Compared with Total Jobs – Number of HR O-37
Value Added per Employee FN O-126
Vehicle Accidents on Airport Premises SR K-9
Vehicle Maintenance Cost MN O-35
Vehicle Maintenance Cost per Enplanement MN O-36
Vehicle Maintenance Cost per Vehicle MN O-37
Vehicles – Number of MN O-38
Vehicles Parked per O&D Passenger PK O-18
Vehicles Parked per Originating Passenger PK K-7
Violation of Security Rules Airfield and Perimeter PS O-43

W

Wait Times at Major Processing Sites Other than Security Checkpoints SQ K-9
Wait Times at Security Checkpoints SQ K-10
Warning Citations Issued per Year PS O-44
Waste and Disposables Recycled (%) EV O-39
Waste Recycling EV K-11
Water & Sewer Cost per Enplanement EV O-40
Water & Sewer Cost per Terminal Bldg Area With Water & Sewer Service (S.F.) EV O-41
Water Consumption – Change over Prior Period EV O-42
Water Consumption per Enplanement EV O-43
Waterless Public Restroom Urinals and Toilets (%) EV O-44
Wayfinding – Passenger Perception SQ K-11
Weight of Waste/Disposables Recycled EV O-45
WI-FI Gross Sales CN O-38
Wildlife/Bird Alerts SR O-28
Wildlife/Bird Strikes AO K-6
Wildlife/Bird Strikes – Aircraft, per Number of Aircraft Operations SR O-29
Wildlife/Bird Strikes – Ground Vehicles MN O-39
Women Employees at Upper Management Levels to Total Upper Management (%) HR O-38

Copyright National Academy of Sciences. All rights reserved.

Women Employees to Total Employees (%)	HR O-39
Work Orders Completed within Guidelines (%)	MN O-40
Workers Compensation Claims – Number	SR O-30
Workers Compensation Claims Paid	SR K-10
Workers Compensation Experience Rating Modification Factor	SR O-31
Workforce Diversity	HR K-10
Work-Load Units (WLU)	FN O-127

Copyright National Academy of Sciences. All rights reserved.

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

Copyright National Academy of Sciences. All rights reserved.